Cyclic Triaxial Tests on Eastern Scheldt Sand with Three Different Relative Densities

Jakobsen, Kim Parsberg

Publication date:
1999

Document Version
Early version, also known as pre-print

AAU Geotechnical Engineering Papers ISSN 1398-6465 R 9916

Cyclic triaxial tests on Eastern Scheldt Sand with three different relative densities

K.P. Jakobsen

1999 Laboratory Testing Paper No 32

GEOTECHNICAL ENGINEERING GROUP
AALBORG UNIVERSITY DENMARK

Aalborg Universitet
Geoteknikgruppen
Sohngaardsholmsvej 57
9000 Aalborg

Cyclic Triaxial Tests on Eastern Scheldt Sand With Three Different Relative Densities

Report - December 1999

Cyclic Triaxial Tests on Eastern Scheldt Sand With Three Different Relative Densities

Kim Parsberg Jakobsen
Aalborg University, Aalborg, Denmark

1 INTRODUCTION

This report contains the results of numerous cyclic triaxial tests performed within the framework of the project "Probabilistic Design Tools for Vertical Breakwaters (PROVERBS), MAST III". The performed tests constitute a part of an established data base to be used to estimate the undrained cyclic response of granular materials typically found in connection with the foundation of monolithic coastal structures as vertical breakwaters. As the data base is oriented to provide the necessary soil parameters for feasibility studies of coastal structures and to help in the design of optimal laboratory testing programs on actual sites, it is necessary to take some of the factors that affect the cyclic response into account.

Some of the factors that affect the cyclic stress-strain response of soil are listed below (Seed and Lee, 1966; Lee and Seed, 1967; Mulili et al. 1975; Pillai and Byrne, 1994):

- Initial density
- Initial state of stress
- Load amplitude
- Number of cycles
- Overconsolidation and preshearing
- Grain size and grading
- Drainage characteristic of the deposit

In the present study the effects of the first four points on the list have been considered. The study is accomplished by performing several undrained cyclic triaxial tests, on specimens with three different initial relative densities, starting from different initial states of stress and applying various load amplitudes.

The tests are performed on reconstituted medium dense to dense samples of Eastern Scheldt Sand. Soil properties, applied equipment and test procedures are described in the succeeding sections, concluding with a summary of the performed tests.

2 EASTERN SCHELDT SAND

Eastern Scheldt Sand is a fine, well-sorted line shore quartz sand, with sub-rounded to rounded grains. The classification properties are summarised in Table 1. For further information about grain size distributions refer to Jakobsen (1998a).

Table 1. Classification properties for Eastern Scheldt Sand.

Property	
Specific gravity, G_s	2.65
Maximum void ratio, e_{max}	0.855
Minimum void ratio, e_{min}	0.591
Maximum grain size, d_{100}	0.500 mm
Mean grain size, d_{50}	0.166 mm
Fines content	1.3 %
Uniformity, U	1.52
Curvature, C	0.99

3 TESTS EQUIPMENT

During the undrained cyclic triaxial test axial load and deformation as well as pore and cell pressures are electronically measured and transmitted to the computer for data processing and fast and accurate actuation of axial load adjustments. In cases where drainage is allowed the volumetric changes can be measured by use of the backpressure system. Information about the used equipment and its capabilities are found in Jakobsen (1998).

To avoid measuring errors due to false deformations of the device, all measurements are performed as close to the specimen as possible. Thus, displacement transducers are mounted on the top and bottom pressure heads, the axial load is measured inside the cell and the pore pressure is measured in the bottom pressure head beneath the porous filter.

4 SPECIMEN PREPARATION

In order to obtain homogeneous stress and strain states in the specimen during testing, all tests are performed on 70×70 mm specimens using lubricated ends (Jacobsen, 1970; Rowe and Barden, 1964; Kirkpatrick, 1974).

The specimens are prepared by dry and moist tamping in a split mould, using the undercompaction method (). The preparation method, water content, number of layers, void ratio and relative density for the three test series are given in Table 2.

Table 2. Key characteristics for specimen preparation.

e [-]	D_R [%]	Method	w [%]	Layers
0.671	72.9	Dry	0.0	3
0.573	106.1	Moist	2.0	4
0.619	90.5	Dry	0.0	3

When the moist tamping procedure is used the specimens are prepared with an initial height of 90 mm and afterwards trimmed.

All the specimens are saturated by use of the backpressure and technique, as a high degree of saturation is necessary for the achievement of reliable pore pressure measurements. The degree of saturation is checked by measuring the pore pressure coefficient, B, expressing the ratio between the instant change in pore pressure and the imposed change in the cell pressure (Skempton, 1954). The degree of saturation is found to be acceptable if B-values above 0.975 are obtained.

5 PERFORMED TRIAXIAL TESTS

After saturation all the specimens are isotropically consolidated at a maximum loading rate of 5 kPa per minute to an effective radial pressure σ_r' of 125 kPa. The specimens are afterwards anisotropically consolidated to an effective vertical pressure of 250 kPa, equal to a shear stress τ_0 of 62.5 kPa.

In order to simulate the stress history of soil deposits located under water and affected by wave actions the specimens are subjected to preshearing or precycling. The precycling is applied as a drained cyclic sinusoidal load with a shear stress amplitude $\Delta\tau_{cyc}^{pre}$ of 25 kPa, corresponding to 10% of the effective vertical consolidation pressure. After 400 load cycles with a period of 10 seconds the permanent strains have normally stabilised.

The specimens are after precycling brought to a predefined shear stress level τ_a which corresponds to the average shear stress during the cyclic loading step. The change in shear stress $\Delta\tau_a$ is applied under either drained or undrained conditions with the radial pressure kept constant. A sinusoidal loading with a period of 10 seconds and constant load amplitude, defined by the cyclic shear stress amplitude $\Delta\tau_{cyc}$, is afterwards applied. The radial pressure is kept constant throughout the test. The test conditions in terms of initial void ratio, average shear stress and cyclic shear stress amplitude for the performed tests are summarised in Table 3. Graphing of the performed tests are found in Enclosure 1.

Table 3. Test conditions for cyclic triaxial tests.

Test No.	e_0 [-]	$\Delta\tau_a$ [kPa]	Application of $\Delta\tau_a$	$\Delta\tau_{cyc}$ [kPa]
9701.33	0.688	-	-	112.5
9701.34	0.692	-	-	25.0
9701.35	0.689	-	-	56.3
9701.36	0.688	112.5	Drained	50.0
9701.37	0.691	-	-	75.0
9701.38	0.690	75.0	Drained	75.0
9701.39	0.690	-137.5	Undrained	112.5
9701.40	0.690	37.5	Undrained	50.0
9701.41	0.689	72.3	Drained	100.0
9701.42	0.686	112.5	Undrained	150.0
9701.43	0.690	87.5	Undrained	37.5
9701.44	0.689	-112.5	Drained	45.0
9701.45	0.692	75.0	Undrained	100.0
9701.46	0.690	112.5	Drained	150.0
9701.47	0.687	-87.5	Undrained	62.5
9701.48	0.689	-112.5	Undrained	45.0
9701.49	0.685	-87.5	Drained	37.5
9701.50	0.569	-	-	56.3
9701.51	0.570	-	-	125.0
9701.52	0.572	-	-	87.5
9701.53	0.569	62.5	Undrained	75.0
9701.54	0.569	-	-	162.5
9701.55	0.570	112.5	Undrained	125.0
9701.56	0.568	112.5	Drained	125.0
9701.57	0.568	162.5	Undrained	193.8
9701.58	0.569	162.5	Drained	193.8
9701.59	0.572	-75.0	Undrained	25.0
9701.60	0.570	-75.0	Drained	25.0
9701.61	0.571	-100.0	Undrained	50.0
9701.62	0.618	-	-	121.9
9701.63	0.619	-	-	56.3
9701.64	0.617	137.5	Undrained	168.8
9701.65	0.617	-87.5	Undrained	37.5
9701.66	0.619	62.5	Undrained	75.0
9701.67	0.619	100.0	Drained	121.9

6 PRESENTATION OF TEST RESULTS

The analysis of the test results is briefly discussed and parameters used for description of characteristic stress and strain states are defined. During the tests simultaneous values of axial displacement, volumetric change, radial pressure, pore pressure and axial load are measured by the principles outlined in Section 3. As both the measured loads and displacements coincide with the principal axes of stresses and strains the analysis is straight forward. The linear engineering strain measure is adopted for description of the relative deformation of the specimen:

$$\varepsilon_a = \frac{H_0 - H}{H_0} \tag{1}$$

$$\varepsilon_v = \frac{V_0 - V}{V_0} \tag{2}$$

The stresses are given as true stresses, expressing the ratio between current load and current area. The cross sectional area of the specimen is continuously corrected by:

$$A = A_0 \frac{1 - \varepsilon_v}{1 - \varepsilon_a} \tag{3}$$

The test results are in general presented in terms of the shear stress τ and mean stress p':

$$\tau = \tfrac{1}{2}(\sigma'_a - \sigma'_r) = \tfrac{1}{2}(\sigma_a - \sigma_r) \tag{4}$$

$$p' = \tfrac{1}{3}(\sigma'_a + 2\sigma'_r) = \tfrac{1}{3}((\sigma_a - u) + 2(\sigma_r - u)) \tag{5}$$

in which primes ' denote effective stresses.

For description of the cyclic load and the development in stresses and strains during the cyclic step the following quantities are defined:

$$\tau_{cyc}(N) = \tfrac{1}{2}(\tau_{\max} - \tau_{\min}) \tag{6}$$

$$\tau_a(N) = \tfrac{1}{2}(\tau_{\max} + \tau_{\min}) \tag{7}$$

The permanent pore pressure u^p is determined

for τ equal to τ_a after each load cycle. The development in pore pressure is furthermore described in term of the cyclic pore pressure given by:

$$u^{cyc}(N) = \frac{1}{2}(u_{\max} - u_{\min}) \quad (13)$$

The development in strains are given in terms of cyclic axial strain ε_a^{cyc} and permanent or irrecoverable axial strain ε_a^p within each load cycle. The cyclic axial strain is calculated by:

$$\varepsilon_a^{cyc}(N) = \frac{1}{2}(\varepsilon_{\max} - \varepsilon_{\min}) \quad (14)$$

The permanent axial strain is taken at the same time as the permanent pore pressure.

7 SUMMARY OF TEST RESULTS

Results from the tests, outlined in Table 3, are shown in Enclosures 2-36 consisting of four pages each.

Page 1: Test conditions, test programme and results of isotropic and anisotropic consolidation before precycling.

Page 2: Results from precycling, application of $\Delta\tau_a$ and undrained cyclic loading. For the latter these include permanent and cyclic pore pressure and permanent and cyclic axial strain for chosen cycles.

Page 3: Plot of stress-strain response during consolidation steps.

Page 4: Development of shear stress, pore pressure and axial strain quantities with number of cycles applied.

8 ACKNOWLEDGEMENT

The present work was sponsored by the European Community as part of the MAST III project named "Probabilistic Design Tools for Vertical Breakwaters (PROVERBS)", contract MAS3-CT95-0041.

9 REFERENCES

Jacobsen, M. (1970). *New Odeometer and New Triaxial Apparatus for Firm Soil.* Danish Geotechnical Institute Bulletin No. 27.

Jakobsen, K.P. (1998). *Cyclic Triaxial Tests on Eastern Scheldt Sand.* Aalborg University

Kirkpatrick, W.M., Seals, R.K. and Newman, F.B. (1974). *Stress Distributions in Triaxial Compression Samples.* ASCE, Journal of the Geotechnical Engineering Division, Vol. 100, No. GT2, February, pp. 190-196.

Lee, L. and Seed, H. (1967). *Cyclic Stress Conditions Causing Liquefaction of Sand.* ASCE, Journal of the Soil Mechanics and Foundations Division, Vol. 93, No. SM1, January, pp. 47-70.

Mulili, J., Chan, C. and Seed, H.B. (1975). *The Effect of Method of Sample Preparation on the Cyclic Stress-Strain Behavior of Sands.* University of California, Berkely, Report EERC 75-18.

Pillai, V. and Byrne, P. (1994). *Effect of Overburden Pressure on Liquefaction Resistance of Sands.* Canadian Geotechnical Journal, Vol. 31, No. 1, pp. 53-60.

Rowe, P.W. and Barden, L. (1964). *Importance of Free Ends in Triaxial Testing.* ASCE, Journal of the Soil Mechanics and Foundations Division, Vol. 90, No. SM1, January, pp. 1-27.

Seed, H. and Lee, L. (1966). *Liquefaction of Saturated Sand During Cyclic Loading.* ASCE, Journal of the Soil Mechanics and Foundations Division, Vol. 92, No. SM6, November, pp. 105-134.

Skempton, A.W. (1954). *The Pore Pressure Coefficients A and B.* Géotechnique, Vol. 4, January, pp. 143-147.

10 NOTATION

A	[mm^3]	: specimen area
B	[-]	: Skemptons pore pressure parameter
C	[-]	: coefficient of curvature

d	[mm]	: grain size
D_R	[%]	: relative density
e	[-]	: void ratio
G_s	[-]	: specific gravity
H	[mm]	: specimen height
N	[-]	: number of cycles
p	[kPa]	: mean normal stress
u	[kPa]	: pore pressure
U	[-]	: coefficient of uniformity
V	[mm^3]	: volume
w	[%]	: water content

ε[%]: strain

σ	[kPa]	: pressure
τ	[kPa]	: shear stress
$\Delta\tau$	[kPa]	: change in shear stress

Subscripts

a	: axial, average
v	: volumetric
r	: radial
0	: initial
cyc	: cyclic loading
max	: maximum
min	: minimum

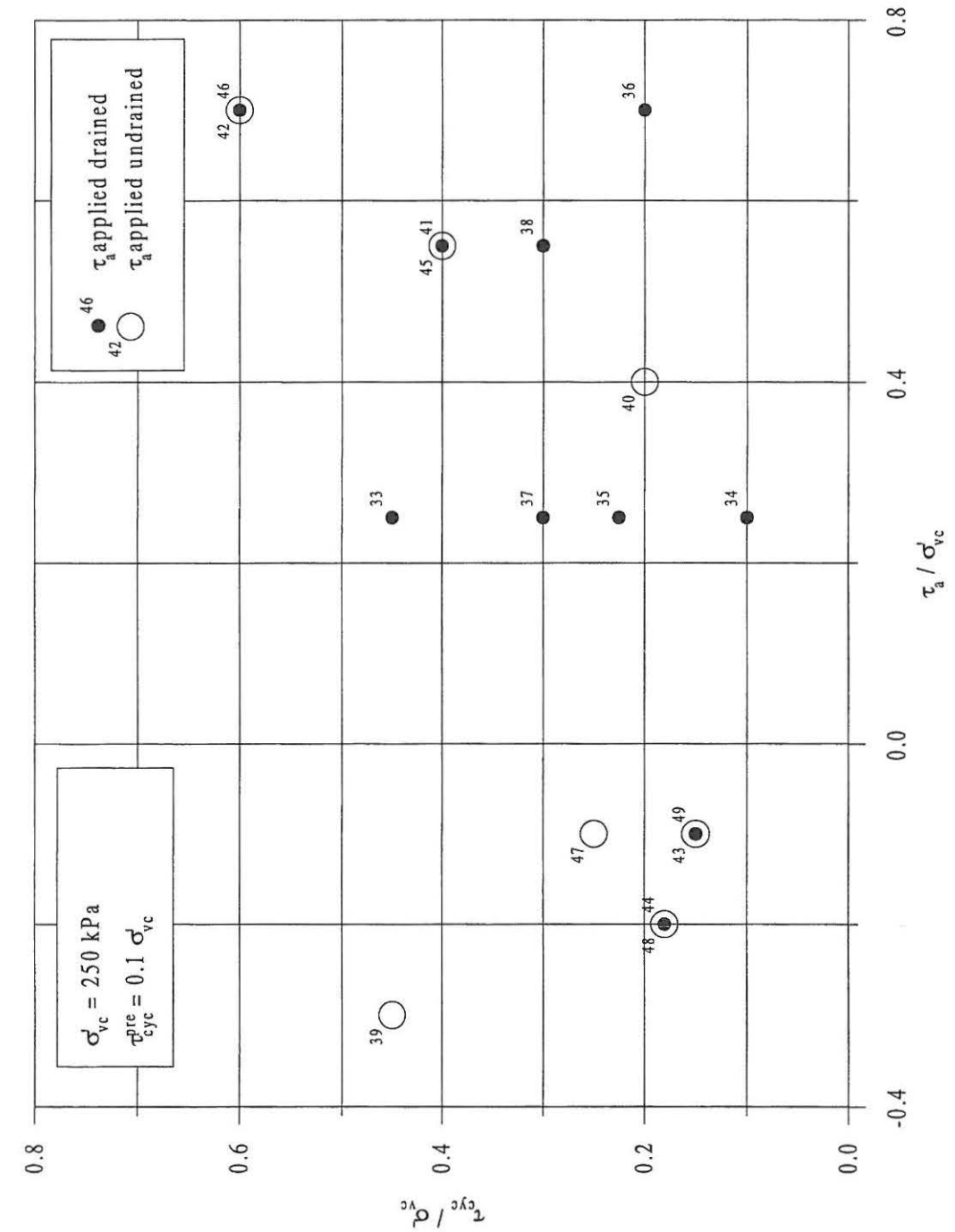
Superscripts

'	: denotes effective parameter
cyc	: cyclic response
pre	: precycling
p	: permanent

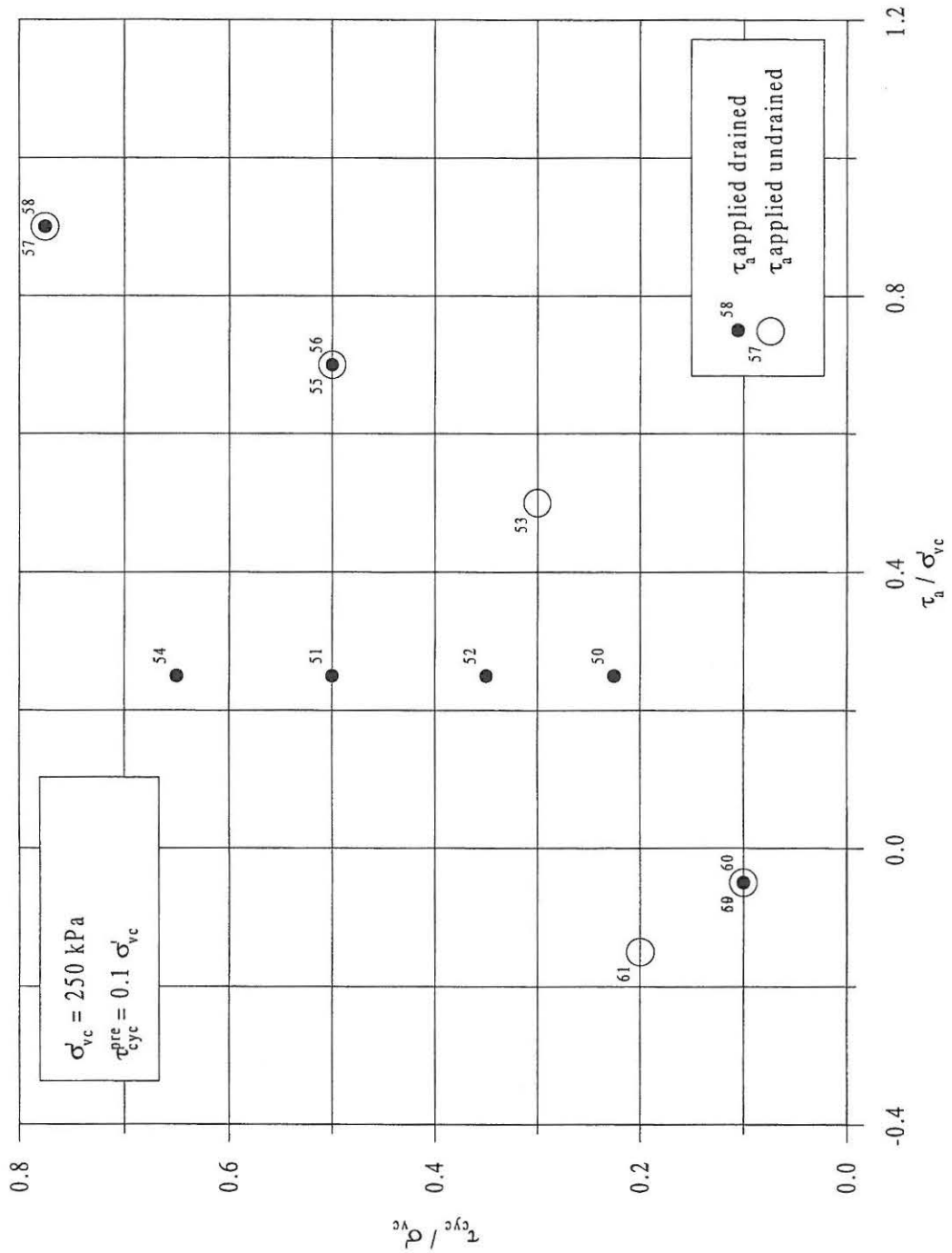
Enclosures

Enclosure 1	Graphing of tests	3 pages
Enclosure 2	Cyclic triaxial test 9701.33	4 pages
Enclosure 3	Cyclic triaxial test 9701.34	4 pages
Enclosure 4	Cyclic triaxial test 9701.35	4 pages
Enclosure 5	Cyclic triaxial test 9701.36	4 pages
Enclosure 6	Cyclic triaxial test 9701.37	4 pages
Enclosure 7	Cyclic triaxial test 9701.38	4 pages
Enclosure 8	Cyclic triaxial test 9701.39	4 pages
Enclosure 9	Cyclic triaxial test 9701.40	4 pages
Enclosure 10	Cyclic triaxial test 9701.41	4 pages
Enclosure 11	Cyclic triaxial test 9701.42	4 pages
Enclosure 12	Cyclic triaxial test 9701.43	4 pages
Enclosure 13	Cyclic triaxial test 9701.44	4 pages
Enclosure 14	Cyclic triaxial test 9701.45	4 pages
Enclosure 15	Cyclic triaxial test 9701.46	4 pages
Enclosure 16	Cyclic triaxial test 9701.47	4 pages
Enclosure 17	Cyclic triaxial test 9701.48	4 pages
Enclosure 18	Cyclic triaxial test 9701.49	4 pages
Enclosure 19	Cyclic triaxial test 9701.50	4 pages
Enclosure 20	Cyclic triaxial test 9701.51	4 pages
Enclosure 21	Cyclic triaxial test 9701.52	4 pages
Enclosure 22	Cyclic triaxial test 9701.53	4 pages
Enclosure 23	Cyclic triaxial test 9701.54	4 pages
Enclosure 24	Cyclic triaxial test 9701.55	4 pages
Enclosure 25	Cyclic triaxial test 9701.56	4 pages
Enclosure 26	Cyclic triaxial test 9701.57	4 pages
Enclosure 27	Cyclic triaxial test 9701.58	4 pages
Enclosure 28	Cyclic triaxial test 9701.59	4 pages
Enclosure 29	Cyclic triaxial test 9701.60	4 pages
Enclosure 30	Cyclic triaxial test 9701.61	4 pages
Enclosure 31	Cyclic triaxial test 9701.62	4 pages
Enclosure 32	Cyclic triaxial test 9701.63	4 pages
Enclosure 33	Cyclic triaxial test 9701.64	4 pages
Enclosure 34	Cyclic triaxial test 9701.65	4 pages
Enclosure 35	Cyclic triaxial test 9701.66	4 pages
Enclosure 36	Cyclic triaxial test 9701.67	4 pages

Cyclic Triaxial Test No. 9701.33-49

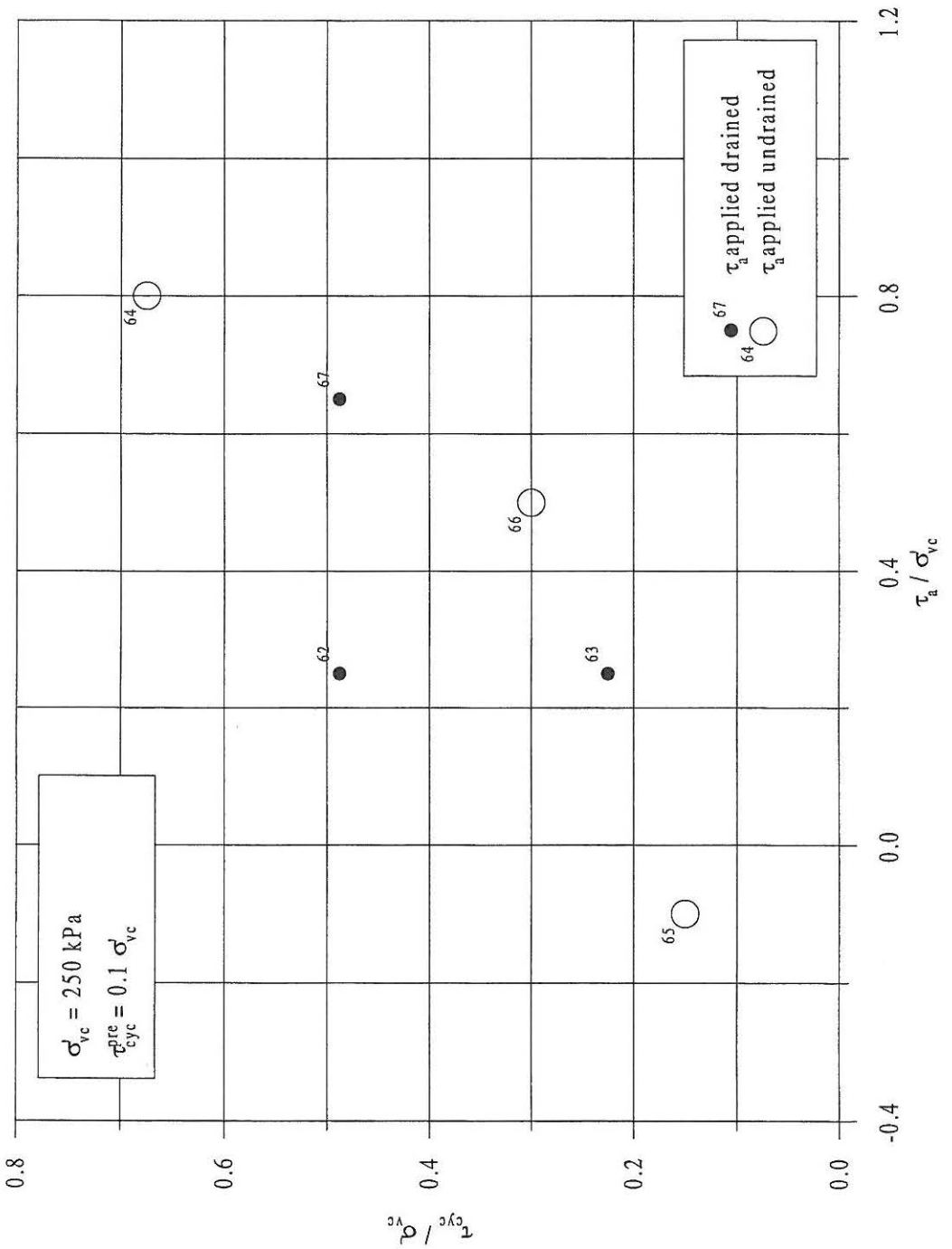


Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 1
Evaluated: KPJ	Checked: KPJ



Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 1 Checked: KPJ

Cyclic Triaxial Test No. 9701.62-67



Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 1 Checked: KPJ

Cyclic Triaxial Test No. 9701.33

Description of soil Eastern Scheldt Sand		Dimension	Before test	Start test	After test
		Height [mm]	71.50	71.44	63.96
Cyclic Triaxial Apparatus		Diameter [mm]	69.70	69.64	73.55
Calibration file Kal9701.dat	Date 1997-11-23	Void ratio	0.692	0.688	0.685
		B-value		0.987	

Test program			
	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	62.5	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	112.5	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	421.8	kPa
Pore pressure (u)	300.0	kPa
Axial strain (ε_a)	0.10	%
Volumetric strain (ε_v)	0.42	%

Anisotropic compression		
Shear stress (τ_o)	63.8	kPa
Confining pressure (σ_r)	426.5	kPa
Pore pressure (u)	301.5	kPa
Axial strain (ε_a)	0.35	%
Volumetric strain (ε_v)	0.59	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 2
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.50	%
Volumetric strain (ε_v)	0.64	%

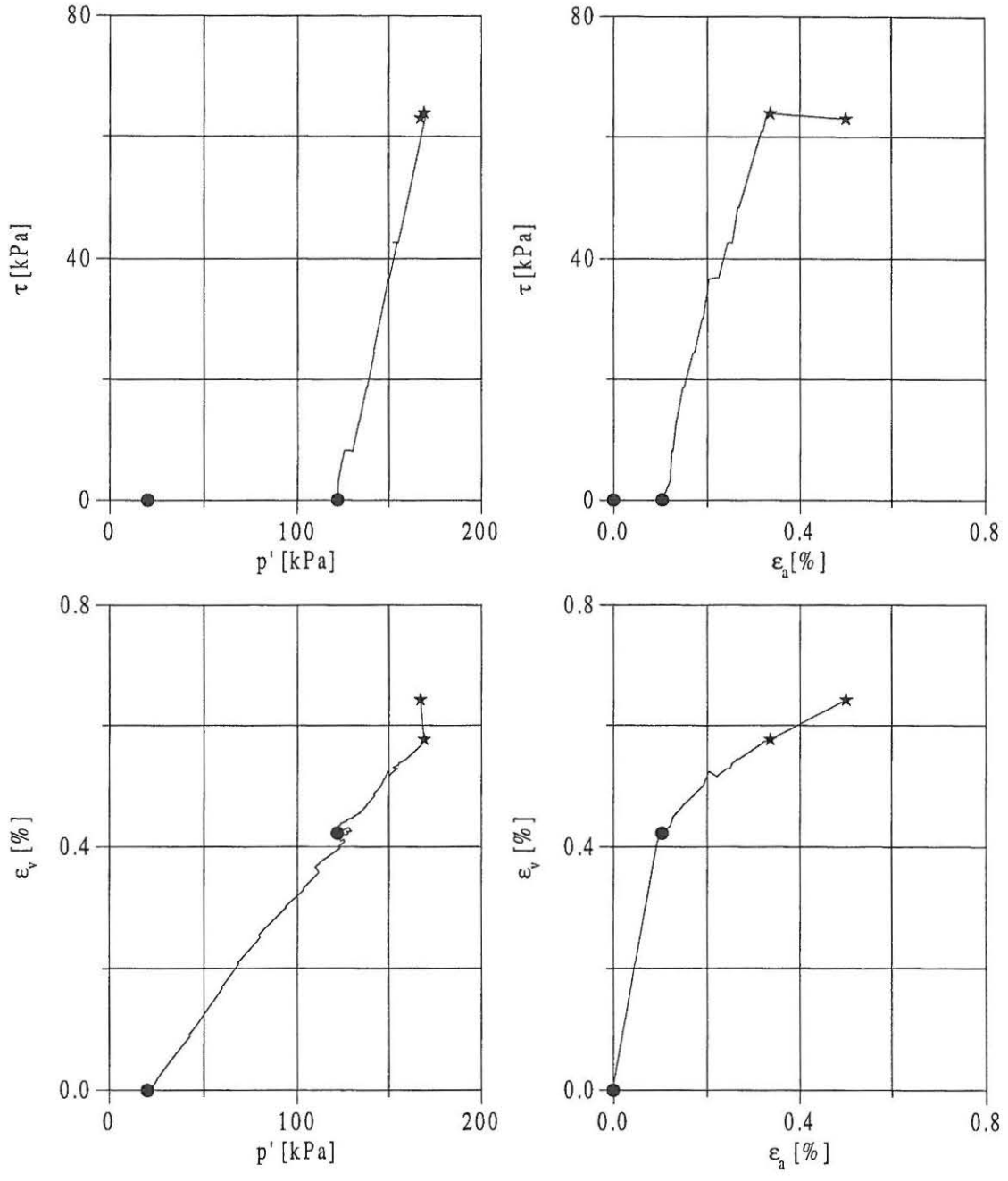
Anisotropic compression	Local	Global	
Shear stress (τ_a)		63.8	kPa
Confining pressure (σ_r)		426.4	kPa
Pore pressure (u)		301.2	kPa
Axial strain (ε_a)	0.00	0.50	%
Volumetric strain (ε_v)	0.00	0.64	%

Cyclic loading	N=1	N=5	N=10	N=13	N=50	
Permanent pore pressure (u^p)	105.0	117.3	116.9	118.2		kPa
Cyclic pore pressure (u^{cyc})	80.7	139.1	135.1	133.6		kPa
Permanent axial strain (ε_a^p)	0.47	3.79	8.20	10.28		%
Cyclic axial strain (ε_a^{cyc})	1.78	6.50	8.26	8.70		%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)						kPa
Cyclic pore pressure (u^{cyc})						kPa
Permanent axial strain (ε_a^p)						%
Cyclic axial strain (ε_a^{cyc})						%
	N=1250	N=1500	N=1750	N=2000	N=3000	
Permanent pore pressure (u^p)						kPa
Cyclic pore pressure (u^{cyc})						kPa
Permanent axial strain (ε_a^p)						%
Cyclic axial strain (ε_a^{cyc})						%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 2 Checked: KPJ

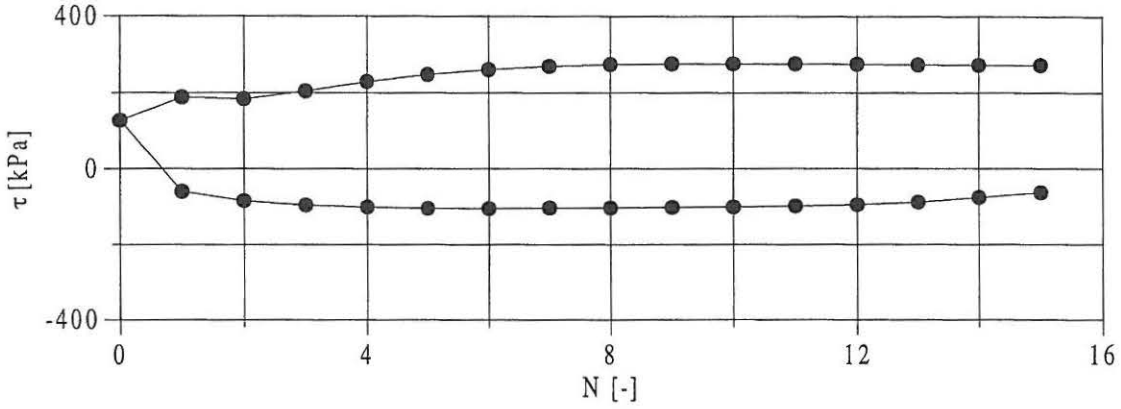
Cyclic Triaxial Test No. 9701.33

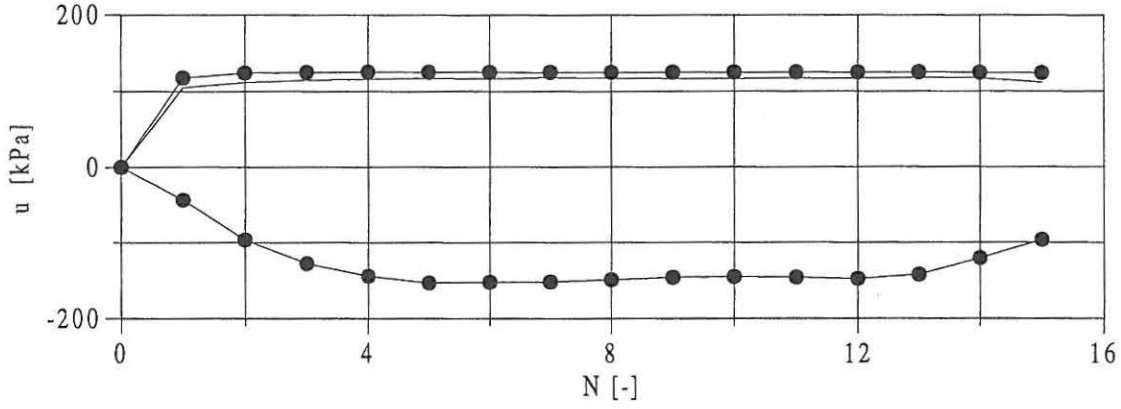


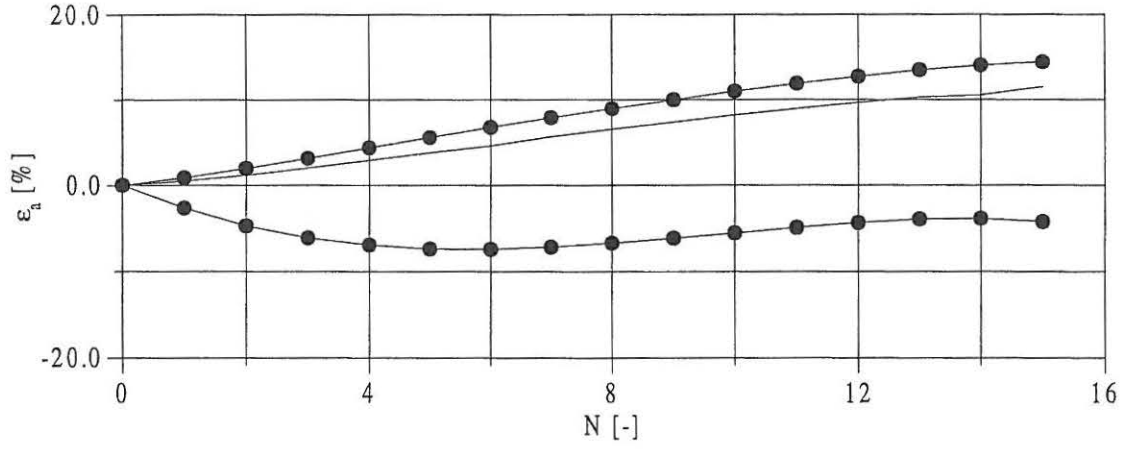
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 2
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- ——— Anisotropic compression
- ★ Precycling







Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 2 Checked: KPJ

Cyclic Triaxial Test No. 9701.34

Description of soil Eastern Scheldt Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm]	71.50	71.49	70.45
		Diameter [mm]	69.70	69.69	70.00
Calibration file Cal.dat	Date 1997-11-25	Void ratio	0.692	0.692	0.682
		B-value		0.990	

Test program			
	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	62.5	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	25.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	425.0	kPa
Pore pressure (u)	300.1	kPa
Axial strain (ε_a)	0.17	%
Volumetric strain (ε_v)	0.37	%

Anisotropic compression		
Shear stress (τ_o)	62.7	kPa
Confining pressure (σ_r)	424.7	kPa
Pore pressure (u)	300.0	kPa
Axial strain (ε_a)	0.40	%
Volumetric strain (ε_v)	0.49	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 3
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.46	%
Volumetric strain (ε_v)	0.57	%

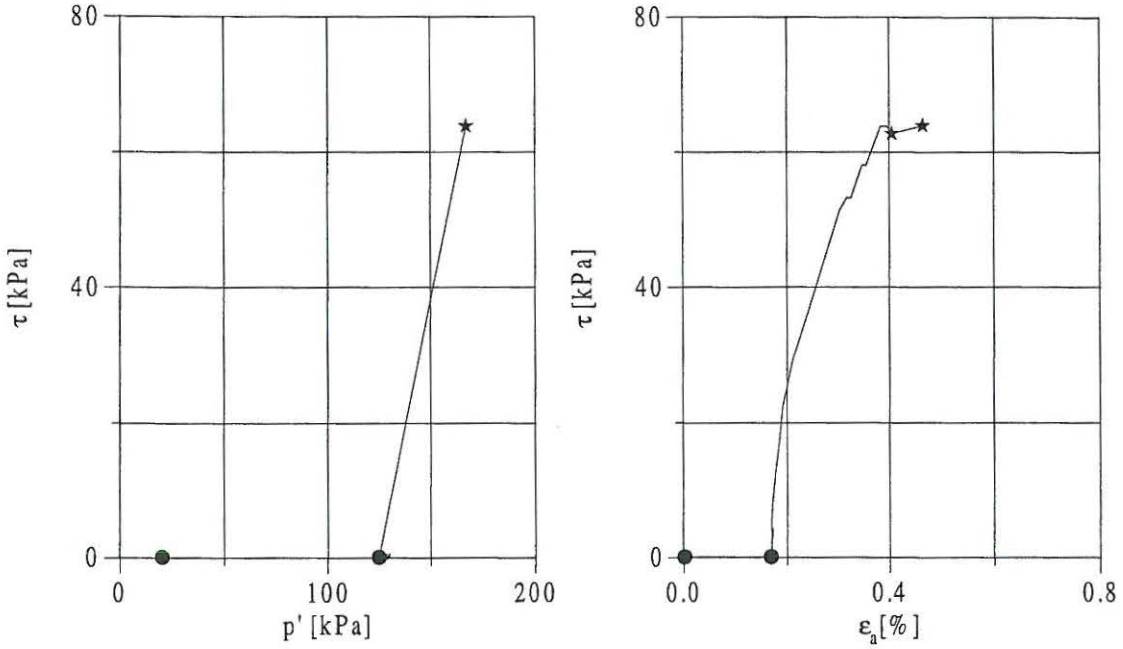
Anisotropic compression	Local	Global	
Shear stress (τ_a)		62.7	kPa
Confining pressure (σ_r)		424.8	kPa
Pore pressure (u)		300.0	kPa
Axial strain (ε_a)	0.00	0.46	%
Volumetric strain (ε_v)	0.00	0.57	%

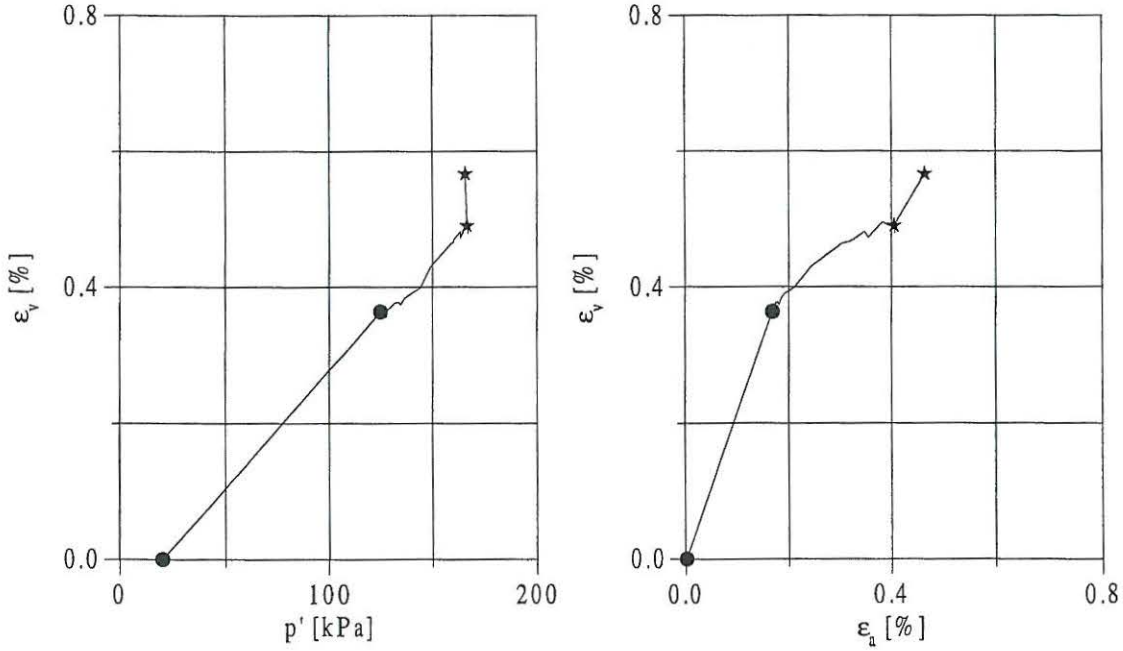
Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	5.6	13.1	17.4	23.9	29.1	kPa
Cyclic pore pressure (u^{cyc})	6.3	7.5	7.6	7.5	7.3	kPa
Permanent axial strain (ε_a^p)	0.07	0.12	0.16	0.22	0.27	%
Cyclic axial strain (ε_a^{cyc})	0.41	0.01	0.01	0.01	0.01	%
	N=100	N=250	N=500	N=1000	N=1500	
Permanent pore pressure (u^p)	34.6	41.0	45.4	49.7	51.9	kPa
Cyclic pore pressure (u^{cyc})	7.1	6.8	6.5	6.1	6.1	kPa
Permanent axial strain (ε_a^p)	0.35	0.46	0.56	0.67	0.75	%
Cyclic axial strain (ε_a^{cyc})	0.01	0.01	0.01	0.01	0.01	%
	N=2000	N=2500	N=3000	N=3500	N=4000	
Permanent pore pressure (u^p)	54.3	55.8	57.1	58.2	58.6	kPa
Cyclic pore pressure (u^{cyc})	6.0	5.8	5.8	5.8	5.5	kPa
Permanent axial strain (ε_a^p)	0.81	0.87	0.91	0.95	0.99	%
Cyclic axial strain (ε_a^{cyc})	0.01	0.01	0.01	0.01	0.01	%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 3
Evaluated: KPJ	Checked: KPJ

Cyclic Triaxial Test No. 9701.34

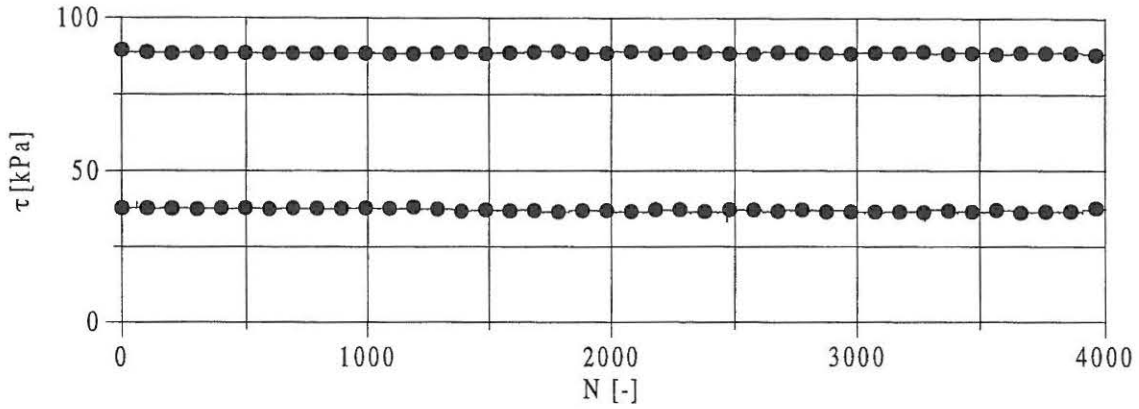


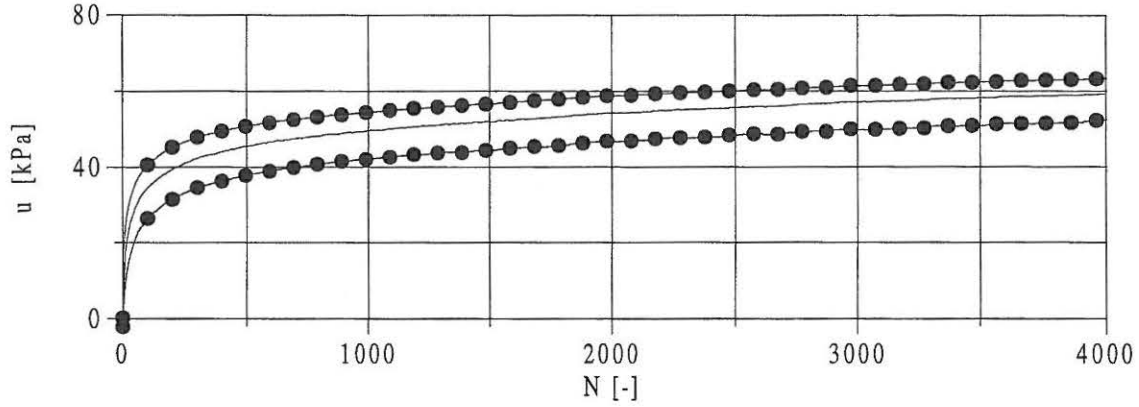


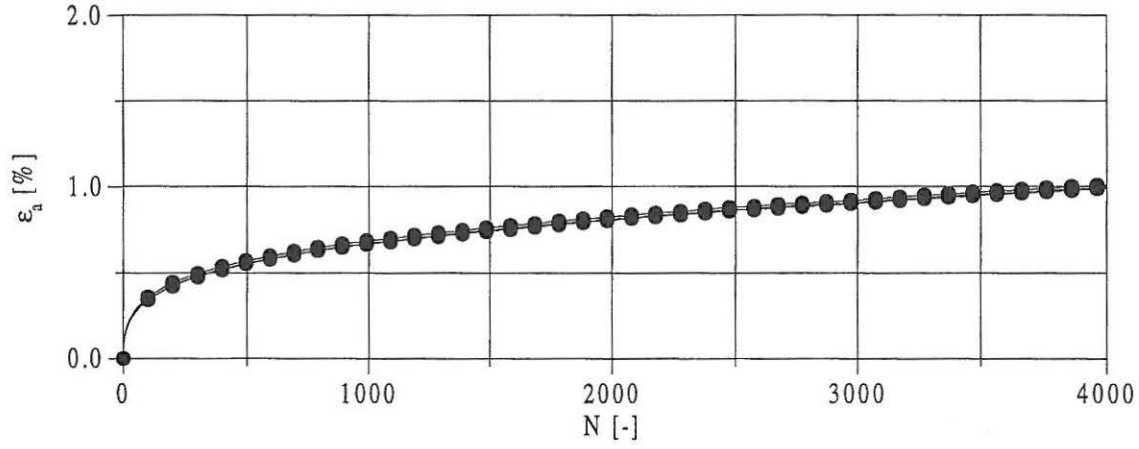
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 3
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling







Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 3 Checked: KPJ

Cyclic Triaxial Test No. 9701.35

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm]	71.50	71.47	66.77
		Diameter [mm]	69.70	69.67	71.80
Calibration file Cal.dat	Date 1997-12-15	Void ratio	0.691	0.689	0.676
		B-value		0.973	

Test program			
	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	62.5	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	56.3	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	425.2	kPa
Pore pressure (u)	300.3	kPa
Axial strain (ε_a)	0.12	%
Volumetric strain (ε_v)	0.42	%

Anisotropic compression		
Shear stress (τ_o)	62.4	kPa
Confining pressure (σ_r)	425.3	kPa
Pore pressure (u)	300.4	kPa
Axial strain (ε_a)	0.46	%
Volumetric strain (ε_v)	0.60	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 4
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.83	%
Volumetric strain (ε_v)	0.78	%

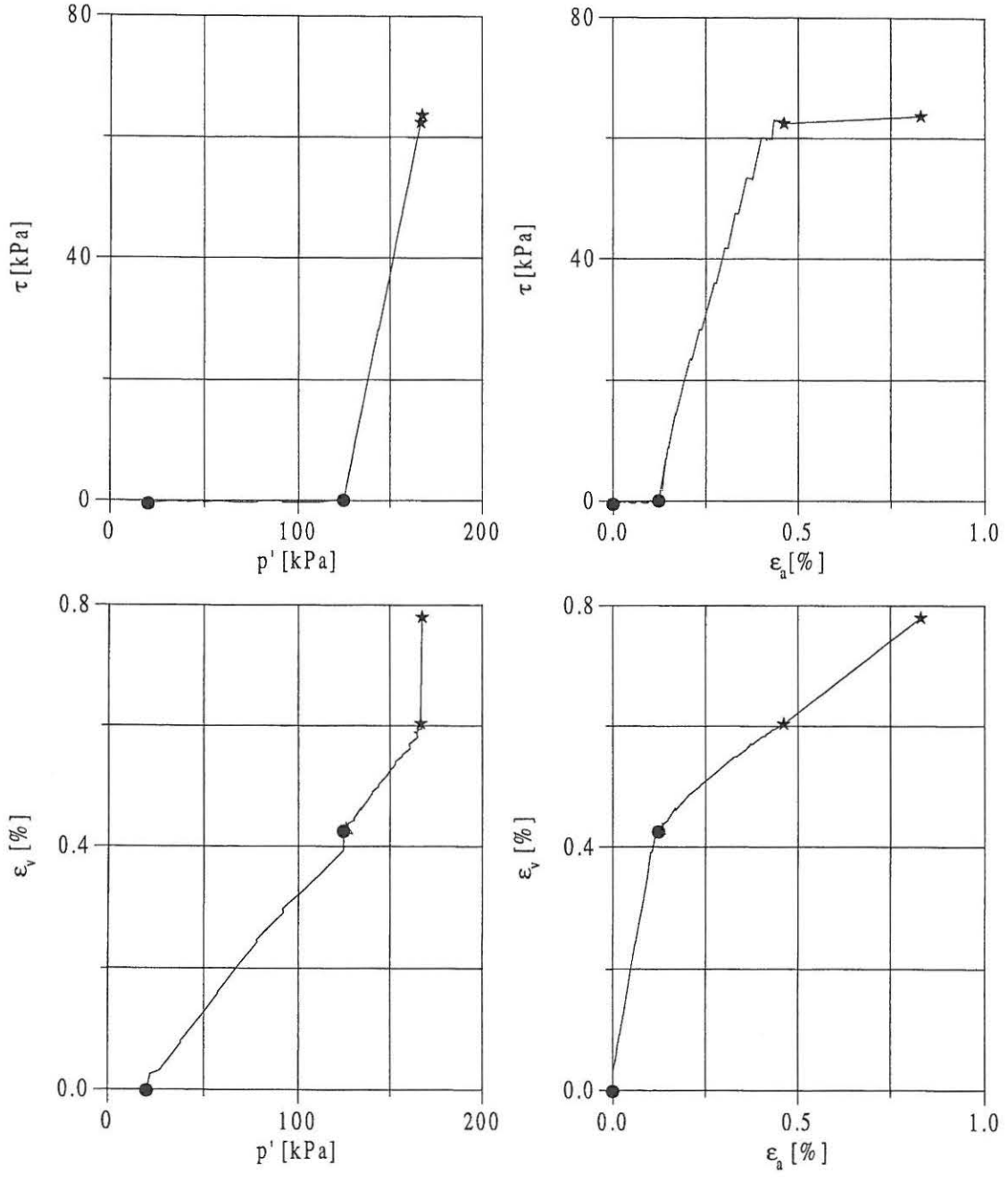
Anisotropic compression	Local	Global	
Shear stress (τ_a)		62.8	kPa
Confining pressure (σ_r)		425.3	kPa
Pore pressure (u)		300.3	kPa
Axial strain (ε_a)	0.00	0.83	%
Volumetric strain (ε_v)	0.00	0.78	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	14.5	35.2	43.7	52.2	57.8	kPa
Cyclic pore pressure (u^{cyc})	12.6	13.5	13.5	12.8	12.5	kPa
Permanent axial strain (ε_a^p)	0.14	0.44	0.69	1.18	1.68	%
Cyclic axial strain (ε_a^{cyc})	0.11	0.07	0.07	0.07	0.07	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	60.8	64.7	66.4	66.9	67.6	kPa
Cyclic pore pressure (u^{cyc})	12.6	12.8	12.7	12.7	12.9	kPa
Permanent axial strain (ε_a^p)	2.32	3.32	4.13	4.75	5.25	%
Cyclic axial strain (ε_a^{cyc})	0.07	0.06	0.06	0.06	0.06	%
	N=1250	N=1500	N=1750	N=2000		
Permanent pore pressure (u^p)	67.1	68.3	70.0	70.2		kPa
Cyclic pore pressure (u^{cyc})	13.2	13.2	13.2	13.2		kPa
Permanent axial strain (ε_a^p)	5.68	6.01	6.30	6.58		%
Cyclic axial strain (ε_a^{cyc})	0.05	0.05	0.05	0.05		%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 4
Evaluated: KPJ	Checked: KPJ

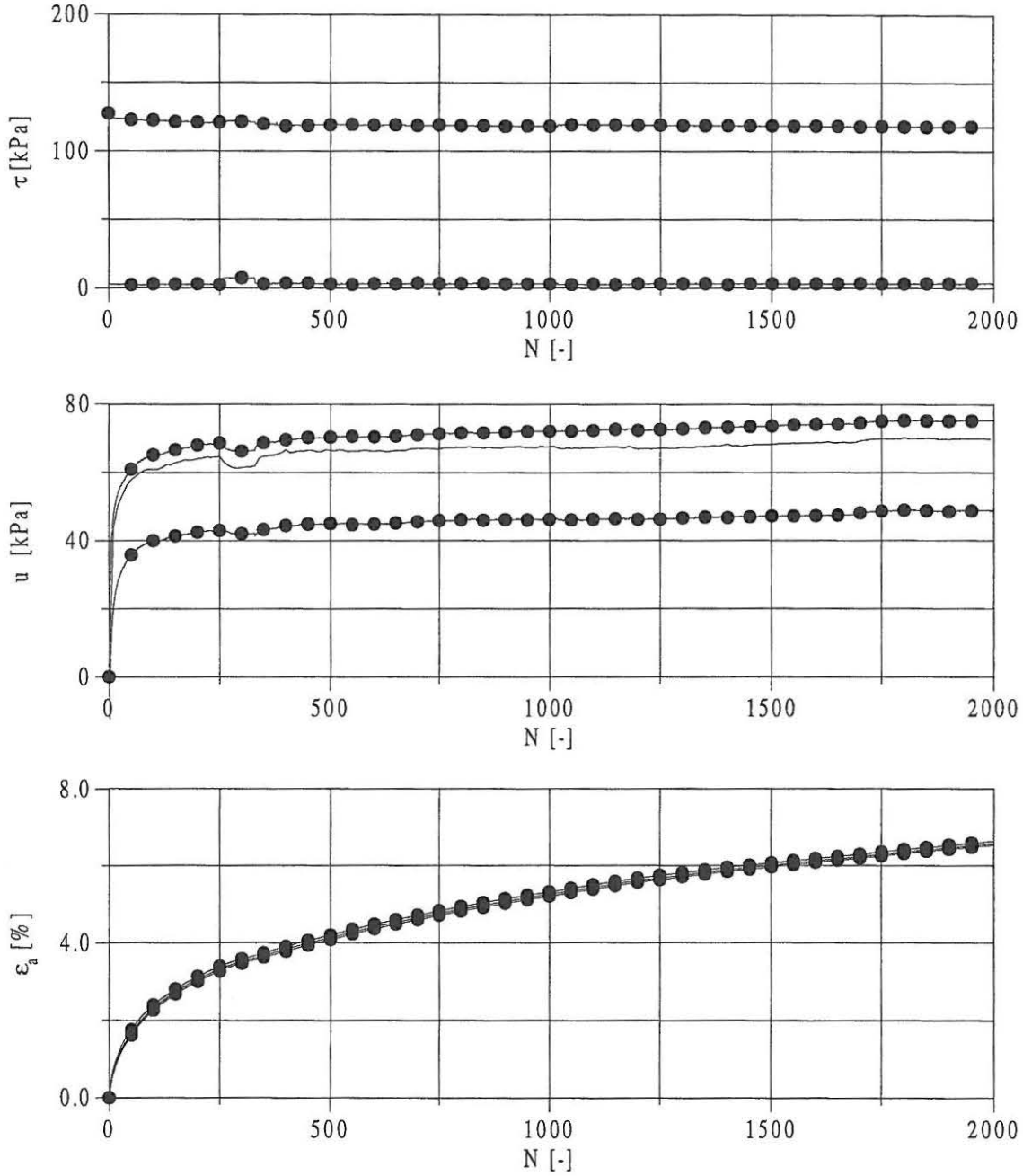
Cyclic Triaxial Test No. 9701.35



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 4
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 4 Checked: KPJ

Cyclic Triaxial Test No. 9701.36

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
		Height [mm]	71.50	71.49	68.17
Cyclic Triaxial Apparatus		Diameter [mm]	69.70	69.69	71.25
Calibration file Cal.dat	Date 1997-11-27	Void ratio	0.689	0.688	0.684
		B-value		0.981	

Test program			
	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	12.5	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	175.0	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	50.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	426.5	kPa
Pore pressure (u)	301.6	kPa
Axial strain (ε_a)	0.10	%
Volumetric strain (ε_v)	0.29	%

Anisotropic compression		
Shear stress (τ_o)	62.7	kPa
Confining pressure (σ_r)	426.5	kPa
Pore pressure (u)	426.5	kPa
Axial strain (ε_a)	0.33	%
Volumetric strain (ε_v)	0.60	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 5
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.57	%
Volumetric strain (ε_v)	0.75	%

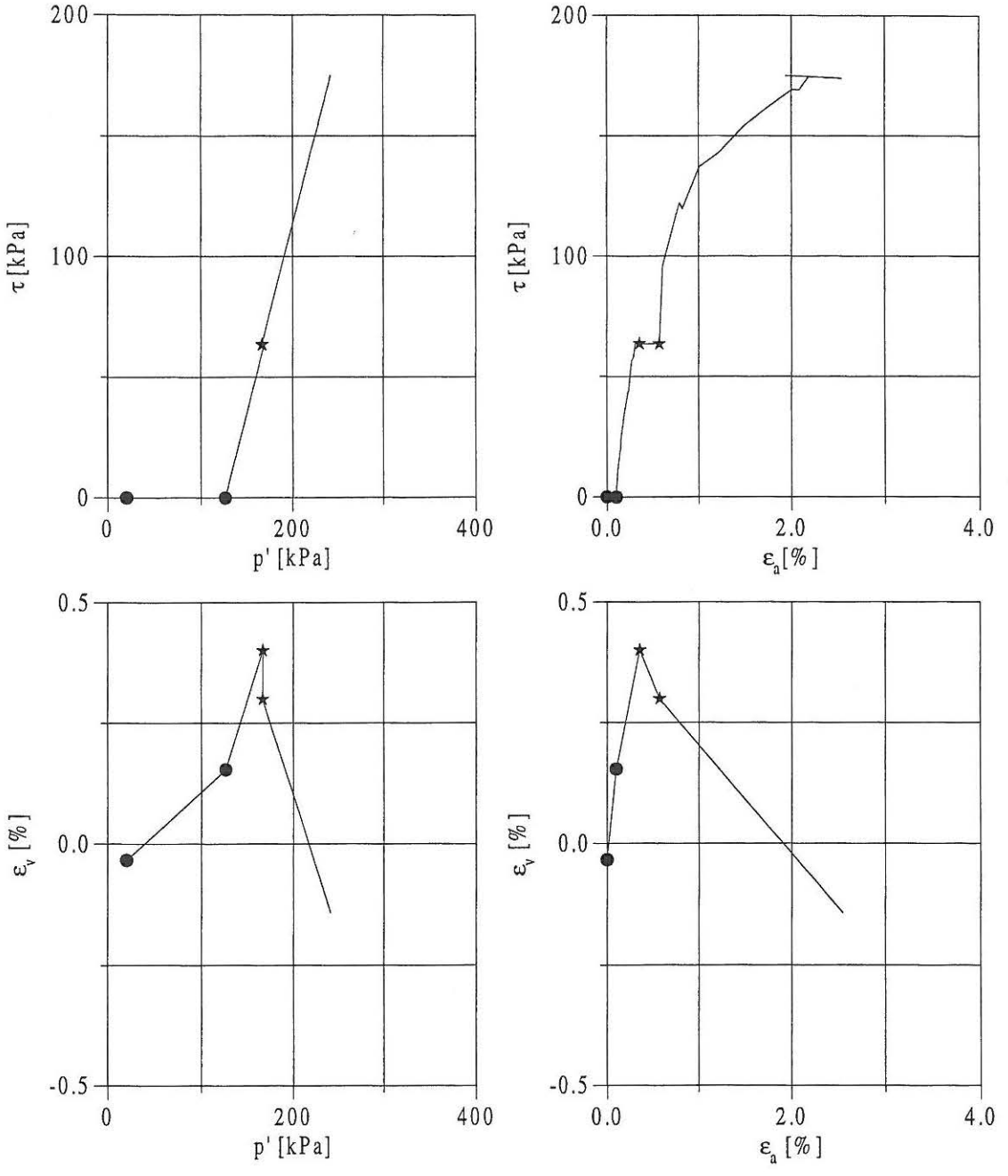
Anisotropic compression	Local	Global	
Shear stress (τ_a)		175.2	kPa
Confining pressure (σ_r)		426.4	kPa
Pore pressure (u)		301.5	kPa
Axial strain (ε_a)	1.97	2.54	%
Volumetric strain (ε_v)	-0.44	0.31	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-26.5	-35.1	-38.3	-41.2	-42.8	kPa
Cyclic pore pressure (u^{cyc})	20.8	8.1	7.9	8.0	8.3	kPa
Permanent axial strain (ε_a^p)	2.77	2.92	3.02	3.18	3.31	%
Cyclic axial strain (ε_a^{cyc})	0.11	0.03	0.02	0.02	0.02	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	-43.6	-43.4	-43.0	-42.4	-42.4	kPa
Cyclic pore pressure (u^{cyc})	8.4	8.5	8.6	8.6	8.8	kPa
Permanent axial strain (ε_a^p)	3.46	3.64	3.78	3.85	3.91	%
Cyclic axial strain (ε_a^{cyc})	0.02	0.02	0.02	0.02	0.02	%
	N=1250	N=1500	N=1750	N=2000		
Permanent pore pressure (u^p)	-41.1	-40.5	-40.4	-40.0		kPa
Cyclic pore pressure (u^{cyc})	9.1	9.1	9.0	9.2		kPa
Permanent axial strain (ε_a^p)	3.96	4.00	4.04	4.07		%
Cyclic axial strain (ε_a^{cyc})	0.02	0.02	0.02	0.02		%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 5 Checked: KPJ

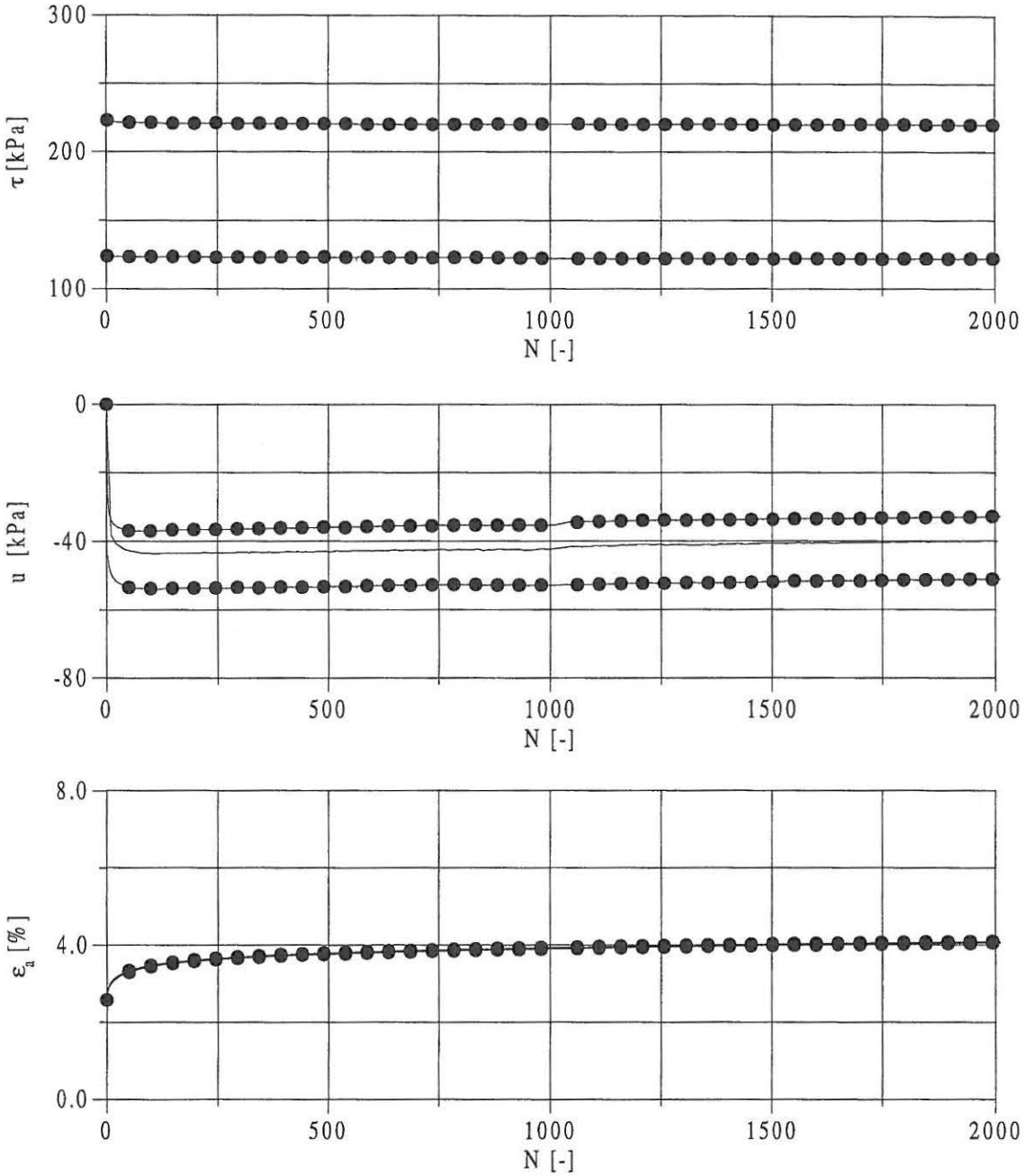
Cyclic Triaxial Test No. 9701.36



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 5
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- — Anisotropic compression
- ★ Precycling



Remarks
Data collection stopped at N=1008, restarted at N=1040

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 5
Evaluated: KPJ	Checked: KPJ

Cyclic Triaxial Test No. 9701.37

Description of soil			Before test	Start test	After test
Oosterschelde Sand		Dimension			
		Height [mm]	71.50	71.50	52.42
Cyclic Triaxial Apparatus		Diameter [mm]	69.70	69.70	81.13
Calibration file	Date	Void ratio	0.691	0.691	0.680
Cal.dat	1997-11-30	B-value		0.993	

Test program			
	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	62.5	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	75.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	426.6	kPa
Pore pressure (u)	301.6	kPa
Axial strain (ε_a)	0.10	%
Volumetric strain (ε_v)	0.39	%

Anisotropic compression		
Shear stress (τ_o)	63.1	kPa
Confining pressure (σ_r)	426.5	kPa
Pore pressure (u)	301.5	kPa
Axial strain (ε_a)	0.36	%
Volumetric strain (ε_v)	0.52	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 6
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.75	%
Volumetric strain (ε_v)	0.63	%

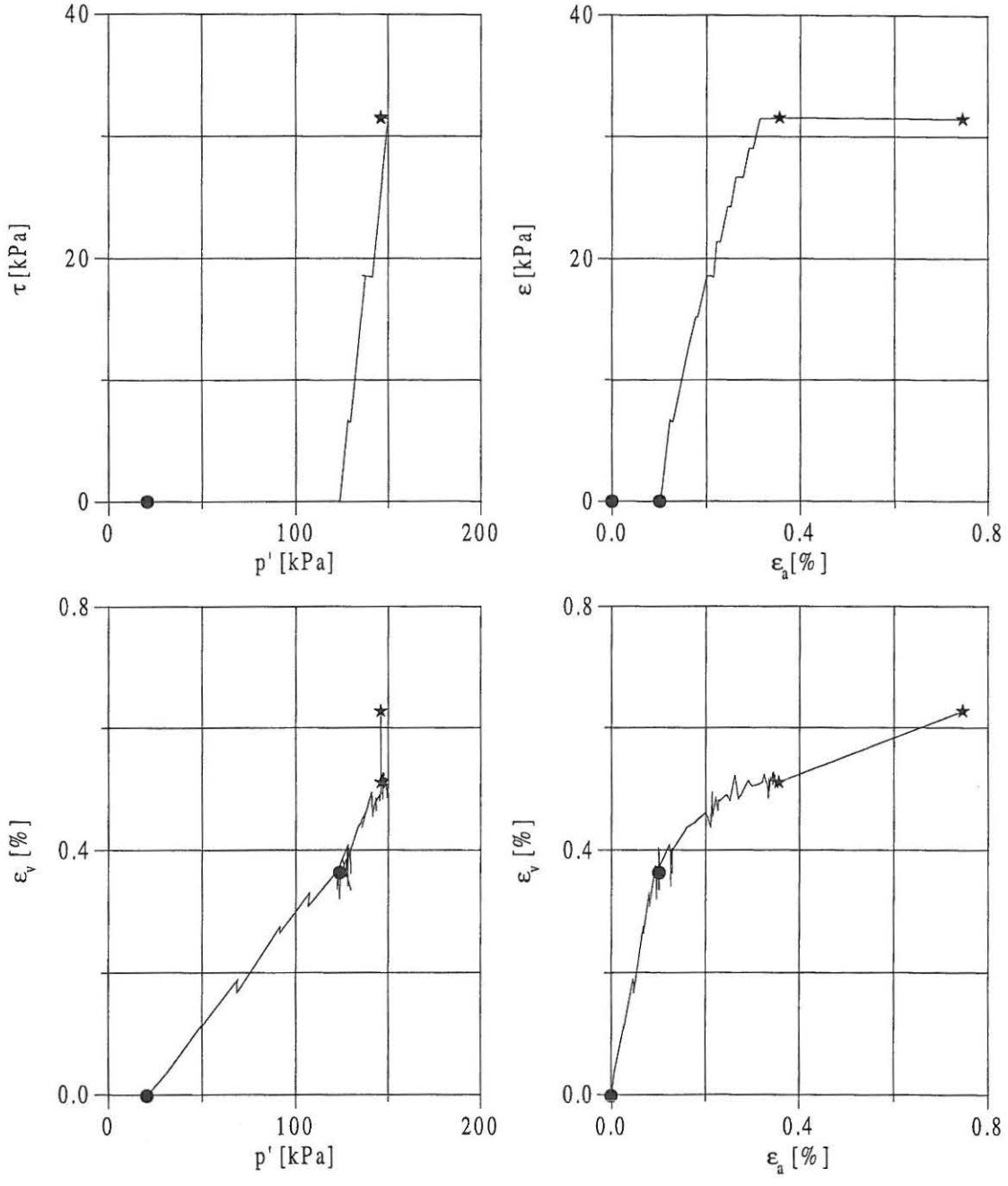
Anisotropic compression	Local	Global	
Shear stress (τ_a)		62.9	kPa
Confining pressure (σ_r)		426.2	kPa
Pore pressure (u)		301.3	kPa
Axial strain (ε_a)	0.00	0.75	%
Volumetric strain (ε_v)	0.00	0.63	%

Cyclic loading	N=1	N=5	N=10	N=25	N=40	
Permanent pore pressure (u^p)	40.9	80.6	96.4	113.3	115.0	kPa
Cyclic pore pressure (u^{cyc})	30.3	33.3	38.7	40.4	37.8	kPa
Permanent axial strain (ε_a^p)	0.21	0.91	1.74	5.64	10.23	%
Cyclic axial strain (ε_a^{cyc})	0.19	0.20	0.31	0.74	0.79	%
	N=50	N=75	N=100			
Permanent pore pressure (u^p)	116.5	118.2	116.5			kPa
Cyclic pore pressure (u^{cyc})	36.9	33.5	30.9			kPa
Permanent axial strain (ε_a^p)	13.09	20.00	26.69			%
Cyclic axial strain (ε_a^{cyc})	0.83	0.85	0.83			%
Permanent pore pressure (u^p)						kPa
Cyclic pore pressure (u^{cyc})						kPa
Permanent axial strain (ε_a^p)						%
Cyclic axial strain (ε_a^{cyc})						%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 6
Evaluated: KPJ	Checked: KPJ

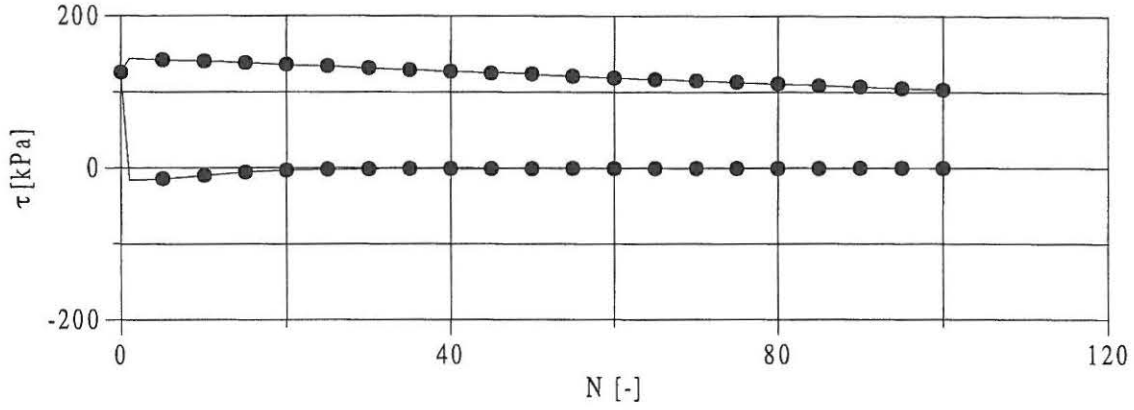
Cyclic Triaxial Test No. 9701.37

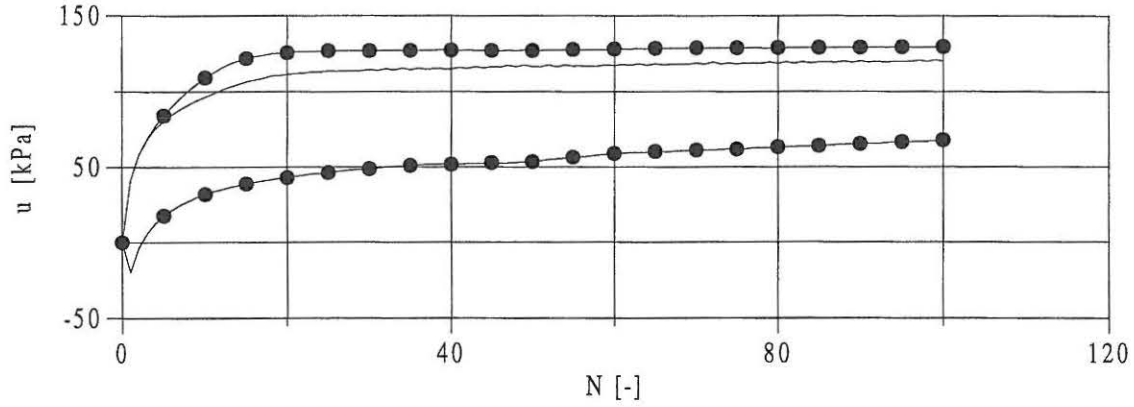


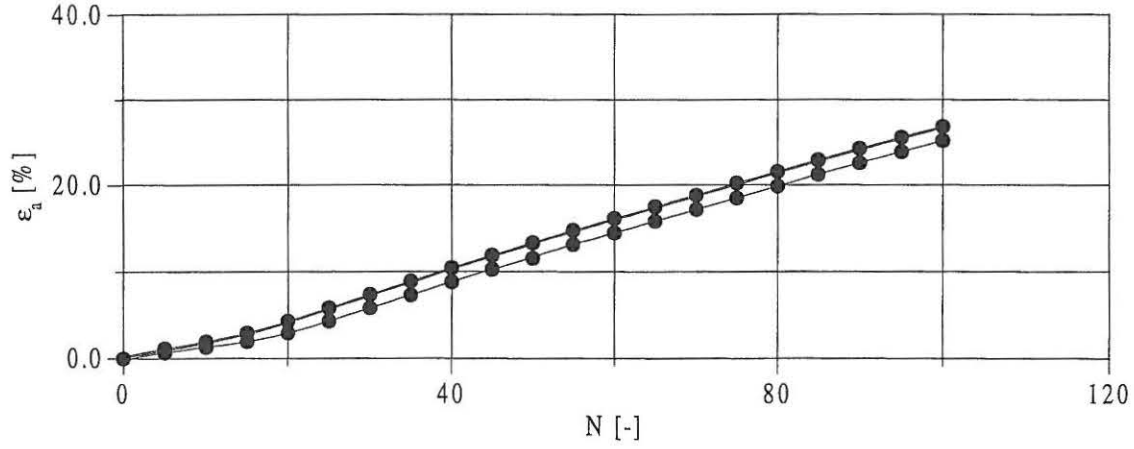
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 6
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- — Anisotropic compression
- ★ Precycling







Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 6 Checked: KPJ

Cyclic Triaxial Test No. 9701.38

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm] Diameter [mm]	71.50 69.70	71.49 69.69	66.66 71.92
Calibration file Cal.dat	Date 1997-12-04	Void ratio B-value	0.690	0.690 0.990	0.678

Test program			
	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	137.5	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	75.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	425.7	kPa
Pore pressure (u)	300.4	kPa
Axial strain (ε_a)	0.09	%
Volumetric strain (ε_v)	0.41	%

Anisotropic compression		
Shear stress (τ_o)	62.7	kPa
Confining pressure (σ_r)	426.2	kPa
Pore pressure (u)	300.4	kPa
Axial strain (ε_a)	0.33	%
Volumetric strain (ε_v)	0.56	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 7
Evaluated: KPJ	Checked: KPJ

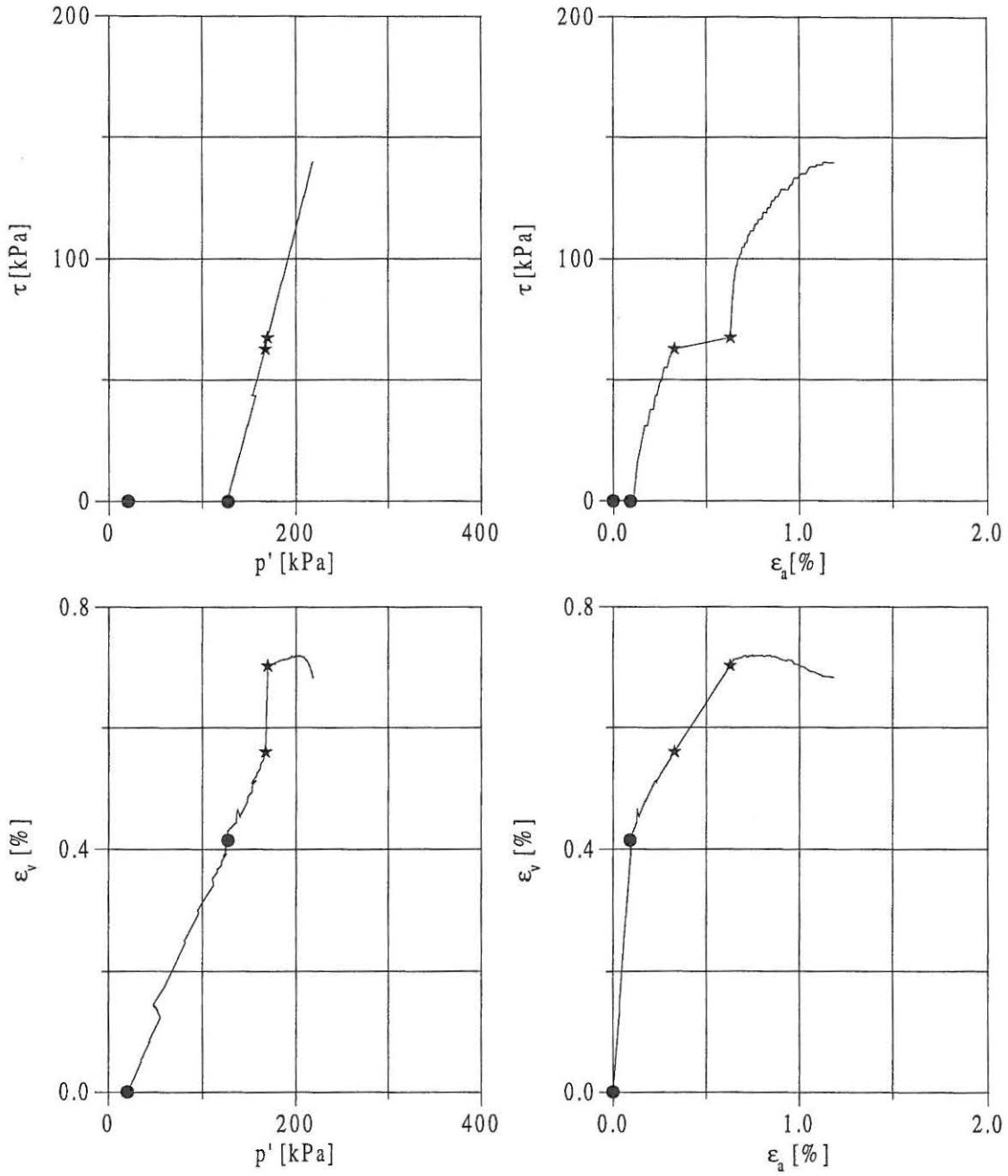
Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.63	%
Volumetric strain (ε_v)	0.70	%

Anisotropic compression	Local	Global	
Shear stress (τ_a)		139.6	kPa
Confining pressure (σ_r)		425.2	kPa
Pore pressure (u)		300.2	kPa
Axial strain (ε_a)	0.56	1.19	%
Volumetric strain (ε_v)	-0.02	0.68	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-25.3	-27.8	-28.5	-28.8	-28.5	kPa
Cyclic pore pressure (u^{cyc})	32.2	14.9	14.2	14.2	14.5	kPa
Permanent axial strain (ε_a^p)	1.29	1.62	1.84	2.19	2.51	%
Cyclic axial strain (ε_a^{cyc})	0.40	0.06	0.05	0.05	0.05	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	-27.3	-24.4	-21.6	-18.4	-16.6	kPa
Cyclic pore pressure (u^{cyc})	15.0	15.1	15.3	15.7	15.6	kPa
Permanent axial strain (ε_a^p)	2.86	3.37	3.85	4.21	4.46	%
Cyclic axial strain (ε_a^{cyc})	0.04	0.04	0.05	0.05	0.04	%
	N=1500	N=2000	N=2500	N=3000	N=3600	
Permanent pore pressure (u^p)	-12.1	-9.4	-7.3	-4.8	-3.0	kPa
Cyclic pore pressure (u^{cyc})	15.2	15.0	14.9	14.8	14.4	kPa
Permanent axial strain (ε_a^p)	4.89	5.25	5.56	5.84	6.12	%
Cyclic axial strain (ε_a^{cyc})	0.04	0.04	0.04	0.04	0.04	%

Remarks:

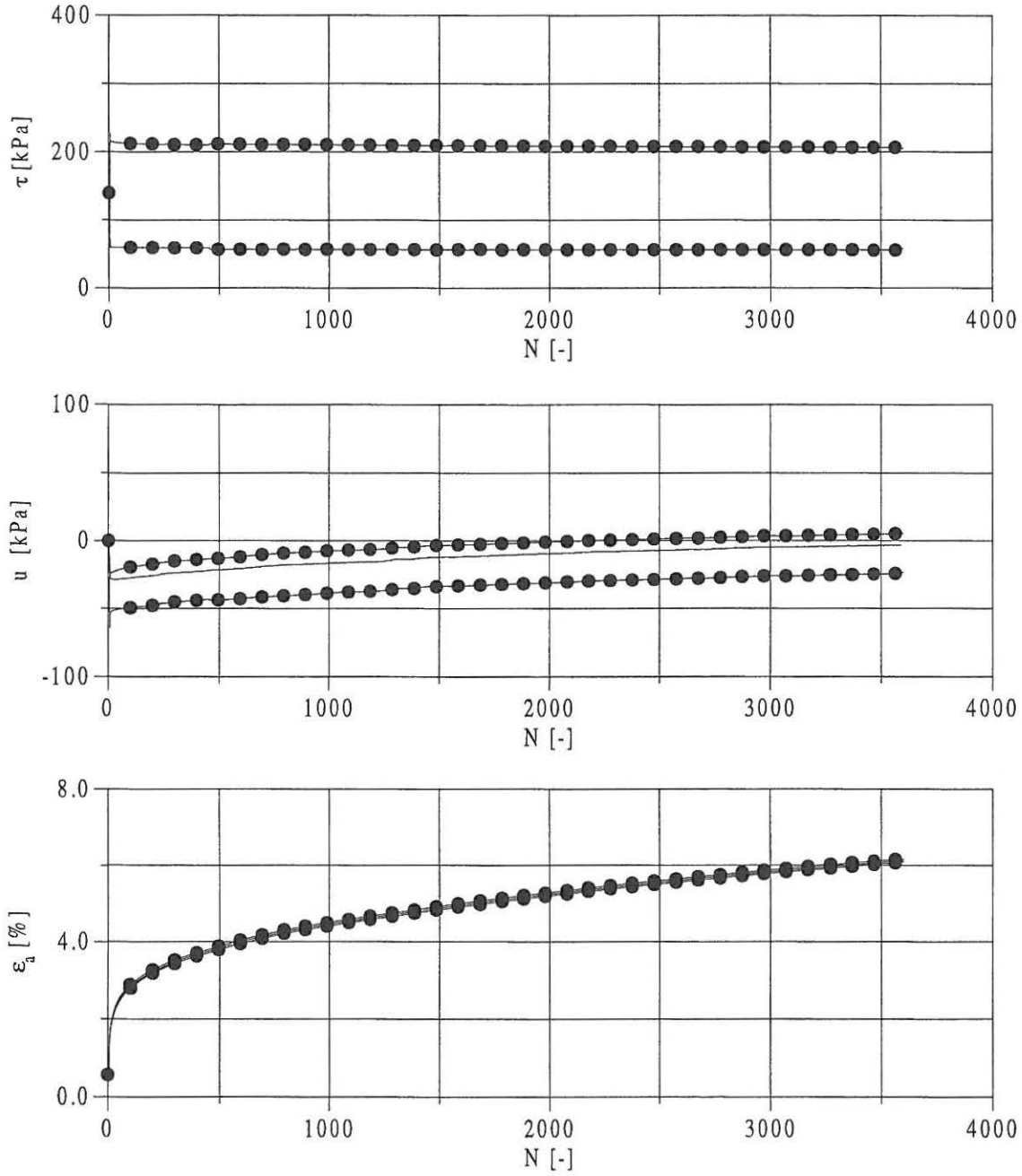
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 7
Evaluated: KPJ	Checked: KPJ



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 7
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- — Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 7
Evaluated: KPJ	Checked: KPJ

Cyclic Triaxial Test No. 9701.39

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm] Diameter [mm]	71.50 69.70	71.50 69.70	
Calibration file Cal.dat	Date 1997-12-06	Void ratio B-value	0.690	0.690 0.980	

Test program	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	-75.0	kPa
	Loading rate:	5.0	kPa/min
	☐ Applied drained		
	☒ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	112.5	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	424.8	kPa
Pore pressure (u)	299.7	kPa
Axial strain (ε_a)	0.12	%
Volumetric strain (ε_v)	0.40	%

Anisotropic compression		
Shear stress (τ_o)	62.5	kPa
Confining pressure (σ_r)	424.7	kPa
Pore pressure (u)	299.7	kPa
Axial strain (ε_a)	0.36	%
Volumetric strain (ε_v)	0.54	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 8
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.81	%
Volumetric strain (ε_v)	0.66	%

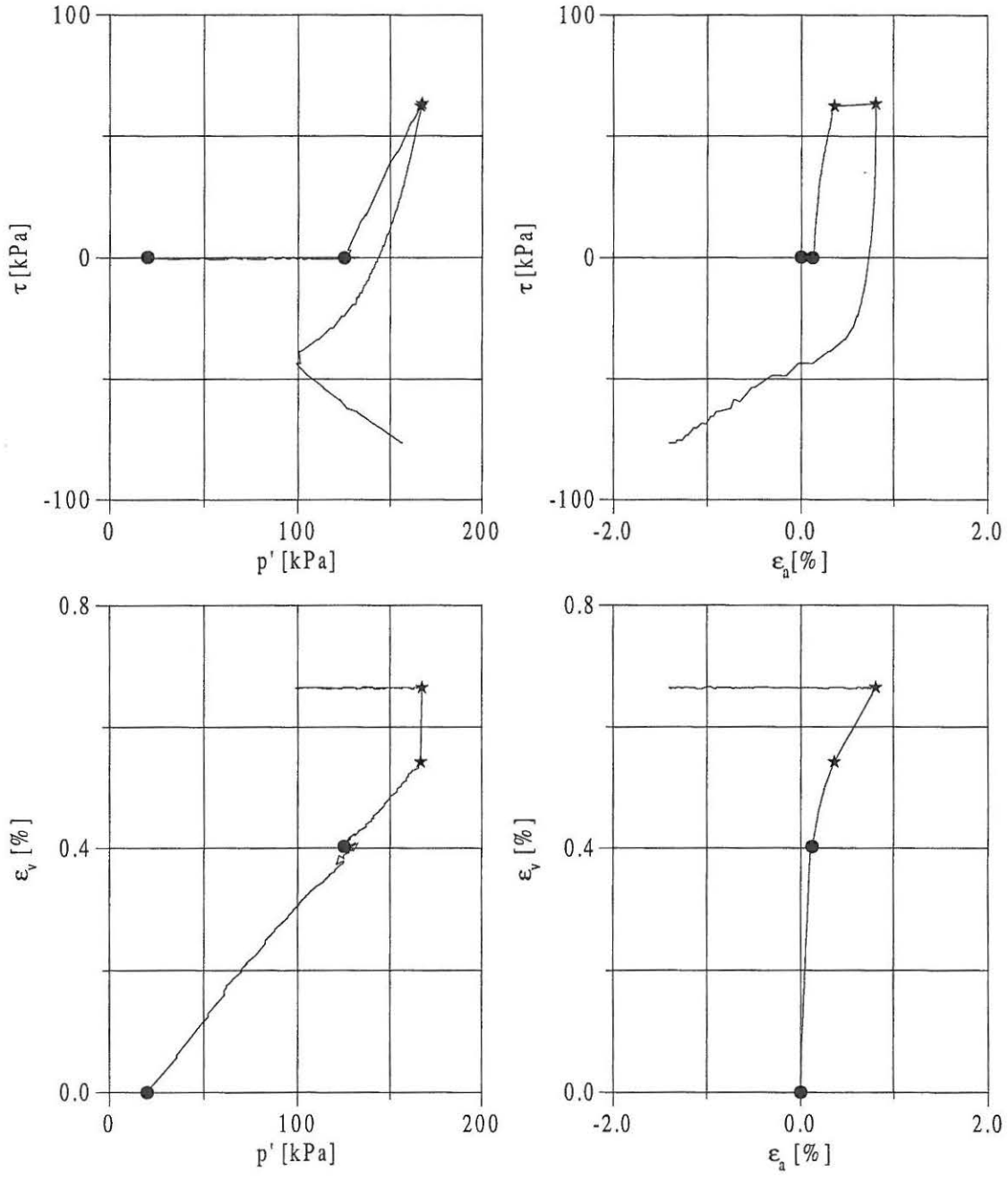
Anisotropic compression	Local	Global	
Shear stress (τ_a)		-76.5	kPa
Confining pressure (σ_r)		425.2	kPa
Pore pressure (u)		217.5	kPa
Axial strain (ε_a)	-2.21	-1.40	%
Volumetric strain (ε_v)	0.00	0.66	%

Cyclic loading	N=1	N=2	
Permanent pore pressure (u^p)	-370.5	-361.8	kPa
Cyclic pore pressure (u^{cyc})	245.6	248.3	kPa
Permanent axial strain (ε_a^p)	-11.02	-16.25	%
Cyclic axial strain (ε_a^{cyc})	5.41	7.43	%
Permanent pore pressure (u^p)			kPa
Cyclic pore pressure (u^{cyc})			kPa
Permanent axial strain (ε_a^p)			%
Cyclic axial strain (ε_a^{cyc})			%
Permanent pore pressure (u^p)			kPa
Cyclic pore pressure (u^{cyc})			kPa
Permanent axial strain (ε_a^p)			%
Cyclic axial strain (ε_a^{cyc})			%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 8
Evaluated: KPJ	Checked: KPJ

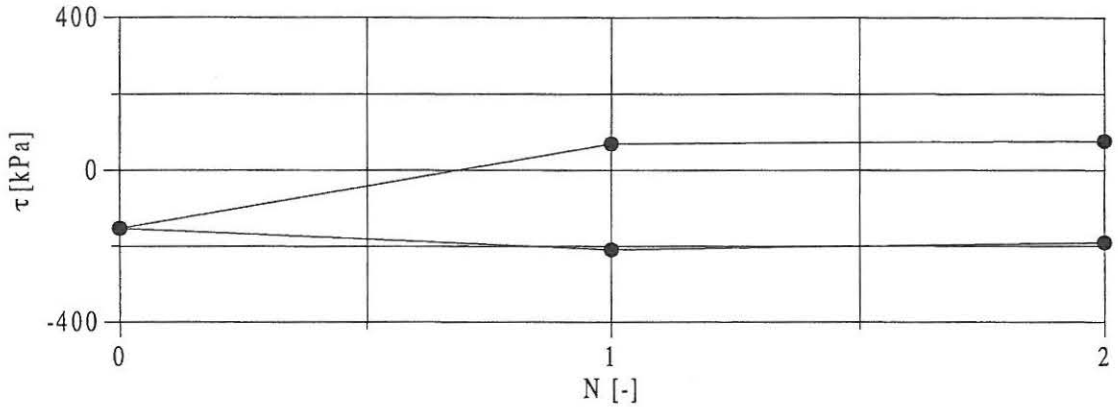
Cyclic Triaxial Test No. 9701.39

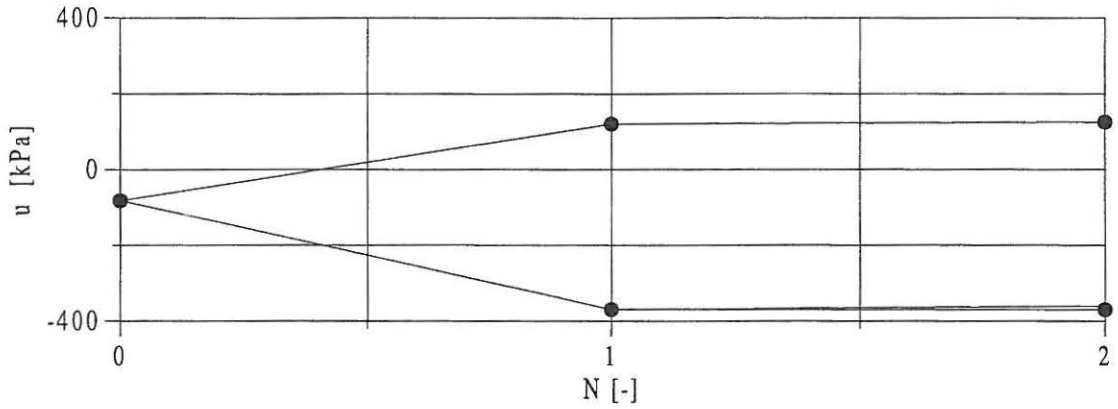


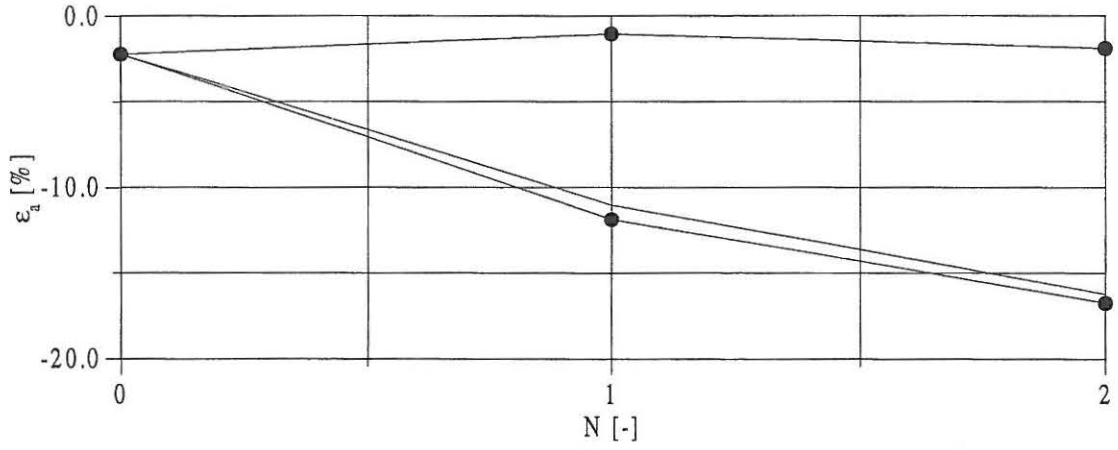
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 8
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- — Anisotropic compression
- ★ Precycling







Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 8 Checked: KPJ

Cyclic Triaxial Test No. 9701.40

Description of soil Oosterschelde Sand			Before test	Start test	After test
Cyclic Triaxial Apparatus		Dimension Height [mm] Diameter [mm]	71.50 69.70	71.49 69.69	69.34 70.53
Calibration file Cal.dat	Date 1997-12-05	Void ratio B-value	0.691	0.690 0.984	0.679

Test program	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	100.0	kPa
	Loading rate:	5.0	kPa/min
	☐ Applied drained		
	☒ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	50.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	425.5	kPa
Pore pressure (u)	300.3	kPa
Axial strain (ε_a)	0.11	%
Volumetric strain (ε_v)	0.42	%

Anisotropic compression		
Shear stress (τ_o)	62.9	kPa
Confining pressure (σ_r)	425.5	kPa
Pore pressure (u)	300.5	kPa
Axial strain (ε_a)	0.32	%
Volumetric strain (ε_v)	0.57	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 9
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.57	%
Volumetric strain (ε_v)	0.67	%

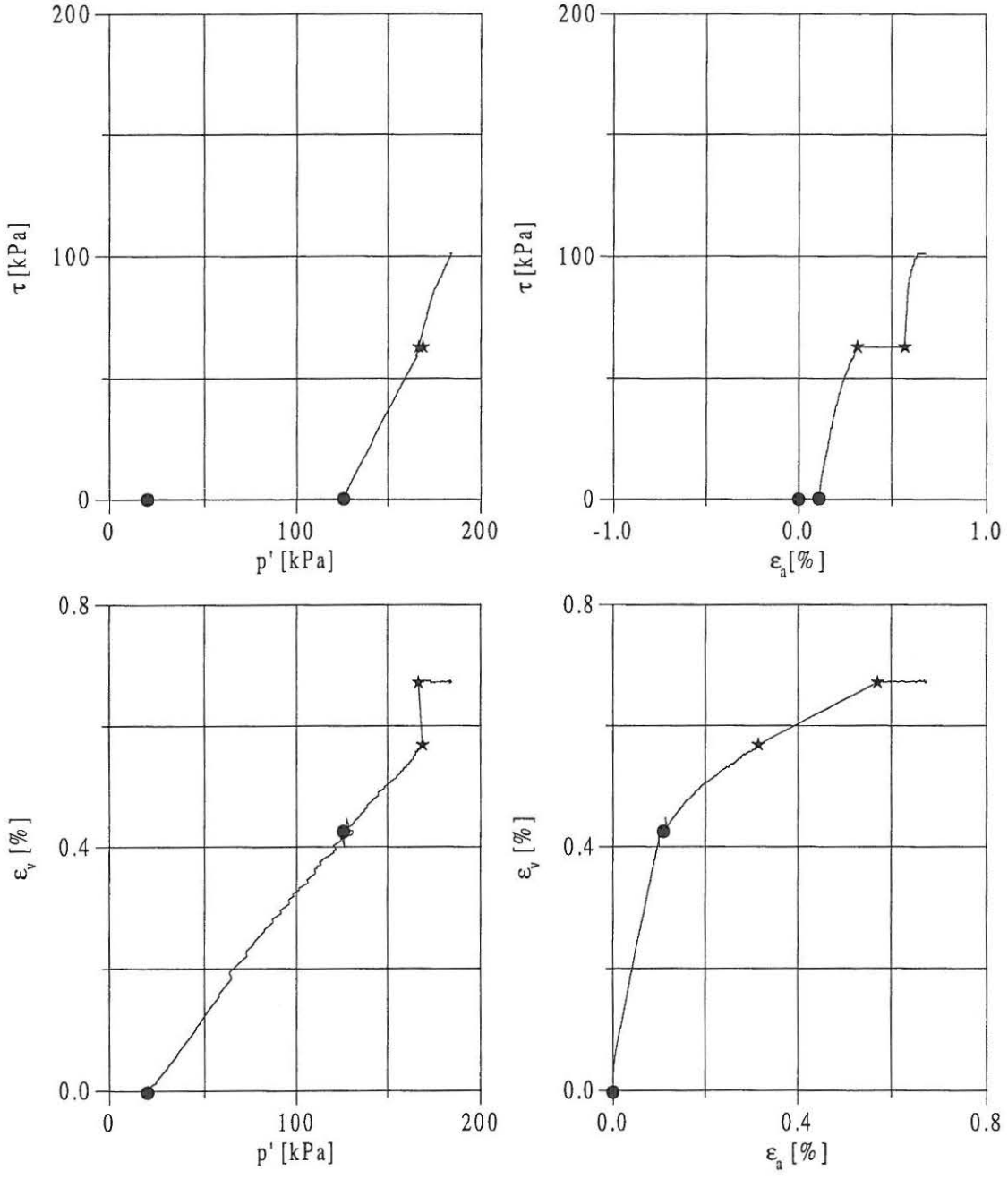
Anisotropic compression	Local	Global	
Shear stress (τ_a)		101.2	kPa
Confining pressure (σ_r)		424.9	kPa
Pore pressure (u)		308.9	kPa
Axial strain (ε_a)	0.11	0.68	%
Volumetric strain (ε_v)	0.00	0.67	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-6.4	-3.7	-2.2	0.2	2.5	kPa
Cyclic pore pressure (u^{cyc})	17.1	11.0	11.2	11.4	11.5	kPa
Permanent axial strain (ε_a^p)	0.49	0.65	0.76	0.95	1.12	%
Cyclic axial strain (ε_a^{cyc})	0.21	0.03	0.03	0.03	0.03	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	4.8	7.9	10.9	11.8	12.6	kPa
Cyclic pore pressure (u^{cyc})	11.6	11.5	11.3	11.2	11.2	kPa
Permanent axial strain (ε_a^p)	1.32	1.60	1.86	2.02	2.14	%
Cyclic axial strain (ε_a^{cyc})	0.03	0.03	0.03	0.03	0.03	%
	N=1250	N=1500	N=1750	N=2000		
Permanent pore pressure (u^p)	13.0	13.4	13.7	13.9		kPa
Cyclic pore pressure (u^{cyc})	11.2	11.1	11.1	11.1		kPa
Permanent axial strain (ε_a^p)	2.23	2.31	2.37	2.44		%
Cyclic axial strain (ε_a^{cyc})	0.03	0.02	0.03	0.03		%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 9 Checked: KPJ

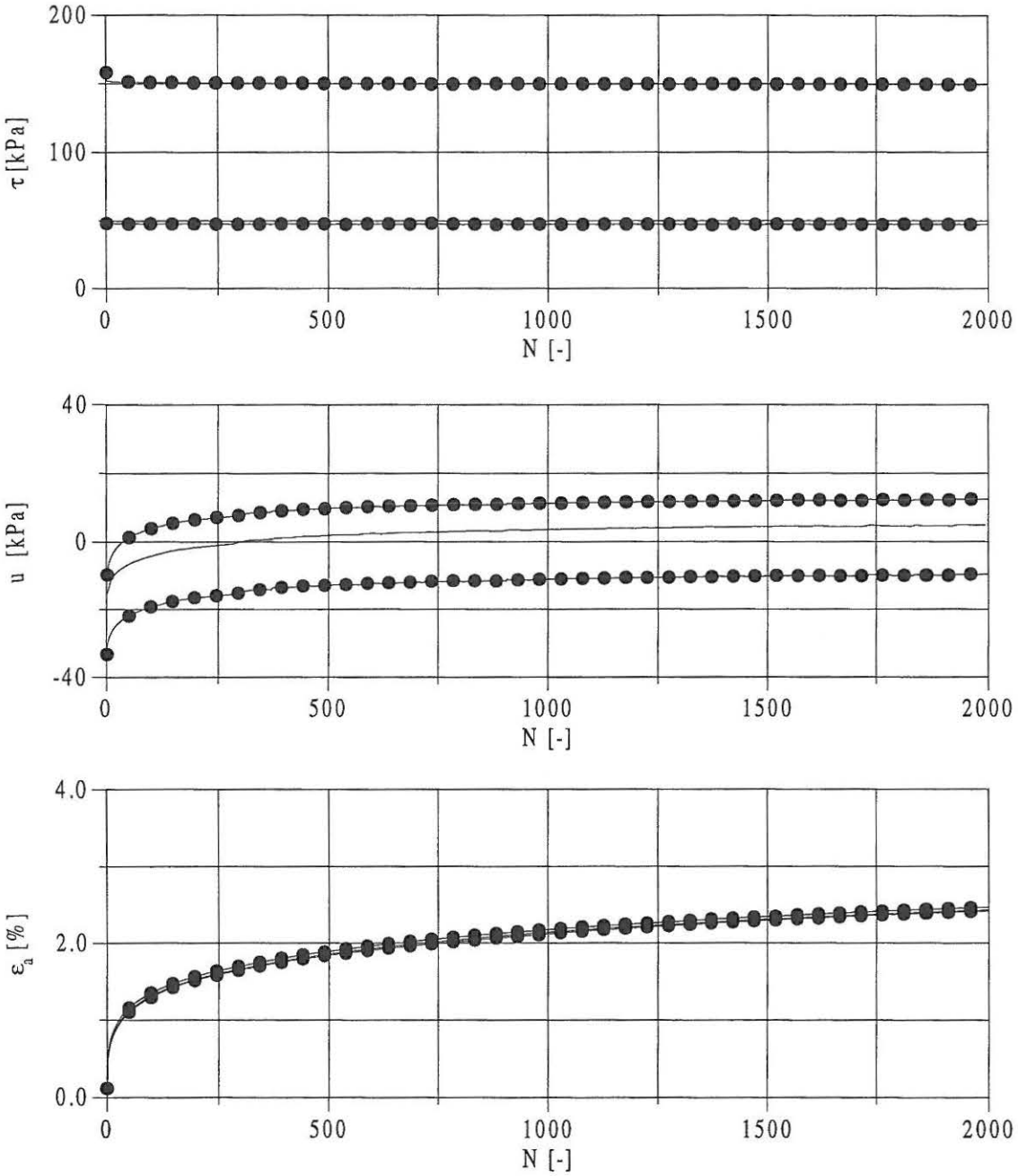
Cyclic Triaxial Test No. 9701.40



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 9
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 9 Checked: KPJ

Cyclic Triaxial Test No. 9701.41

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
		Height [mm]	71.50	71.49	64.63
Cyclic Triaxial Apparatus		Diameter [mm]	69.70	69.69	73.09
Calibration file Cal.dat	Date 1997-12-07	Void ratio	0.690	0.689	0.679
		B-value		0.977	

Test program	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	137.5	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	100.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	525.0	kPa
Pore pressure (u)	400.0	kPa
Axial strain (ε_a)	0.08	%
Volumetric strain (ε_v)	0.38	%

Anisotropic compression		
Shear stress (τ_o)	62.5	kPa
Confining pressure (σ_r)	525.2	kPa
Pore pressure (u)	400.2	kPa
Axial strain (ε_a)	0.28	%
Volumetric strain (ε_v)	0.51	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 10
Evaluated: KPJ	Checked: KPJ

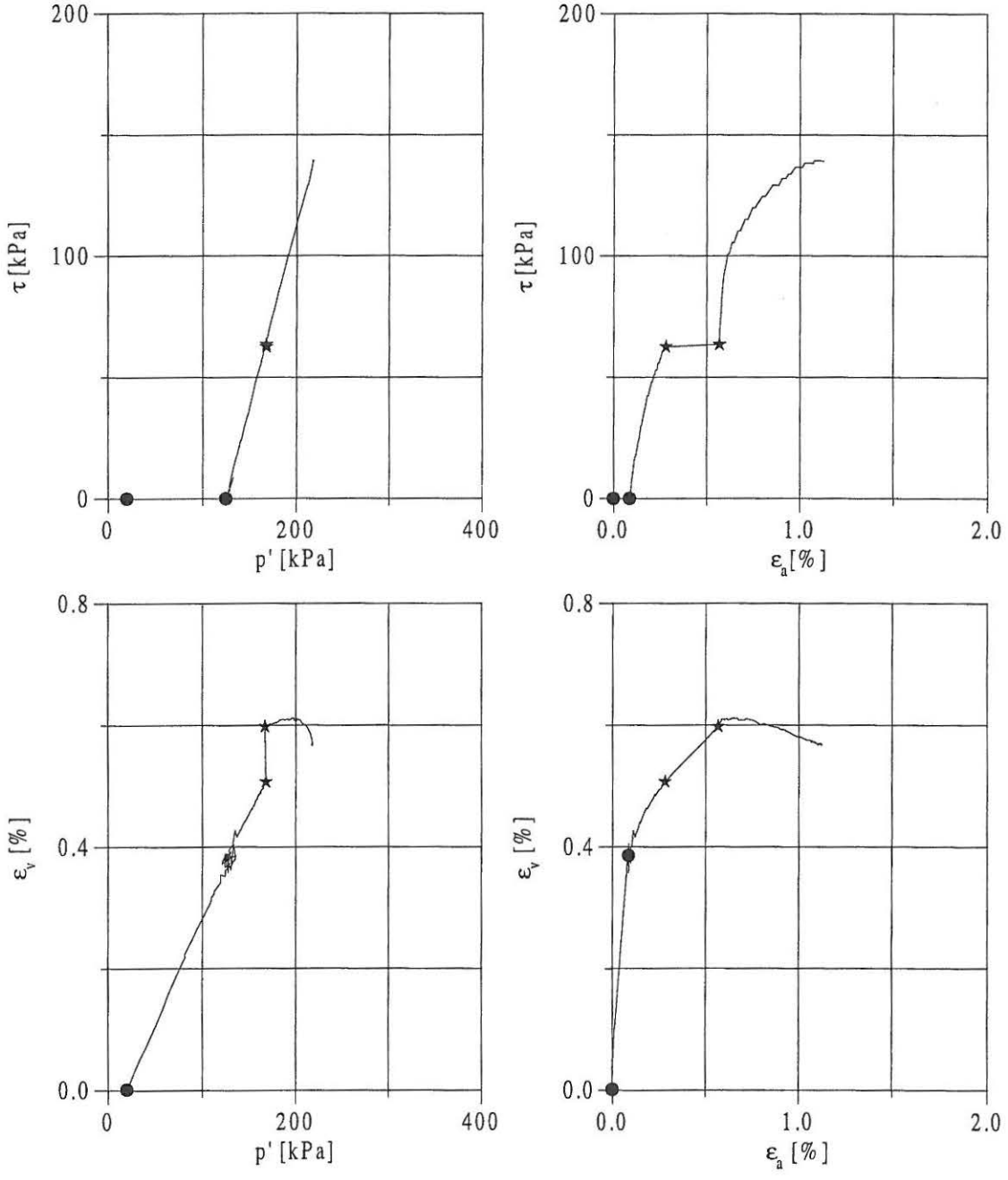
Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.57	%
Volumetric strain (ε_v)	0.60	%

Anisotropic compression	Local	Global	
Shear stress (τ_a)		139.3	kPa
Confining pressure (σ_r)		525.1	kPa
Pore pressure (u)		400.0	kPa
Axial strain (ε_a)	0.55	1.12	%
Volumetric strain (ε_v)	-0.03	0.57	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-22.5	-24.2	24.0	-23.1	-21.6	kPa
Cyclic pore pressure (u^{cyc})	44.3	23.0	20.5	18.7	18.5	kPa
Permanent axial strain (ε_a^p)	1.28	1.86	2.24	2.98	3.50	%
Cyclic axial strain (ε_a^{cyc})	0.41	0.10	0.08	0.07	0.06	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	-19.8	-16.2	-14.7	-10.1	-8.0	kPa
Cyclic pore pressure (u^{cyc})	18.6	19.6	19.6	19.9	20.2	kPa
Permanent axial strain (ε_a^p)	4.24	5.41	6.44	7.12	7.67	%
Cyclic axial strain (ε_a^{cyc})	0.06	0.05	0.05	0.05	0.05	%
	N=1250	N=1500	N=1750	N=2000		
Permanent pore pressure (u^p)	-6.5	-4.9	-3.5	-2.4		kPa
Cyclic pore pressure (u^{cyc})	20.3	20.4	20.5	20.5		kPa
Permanent axial strain (ε_a^p)	8.10	8.46	8.77	9.02		%
Cyclic axial strain (ε_a^{cyc})	0.05	0.05	0.05	0.05		%

Remarks:

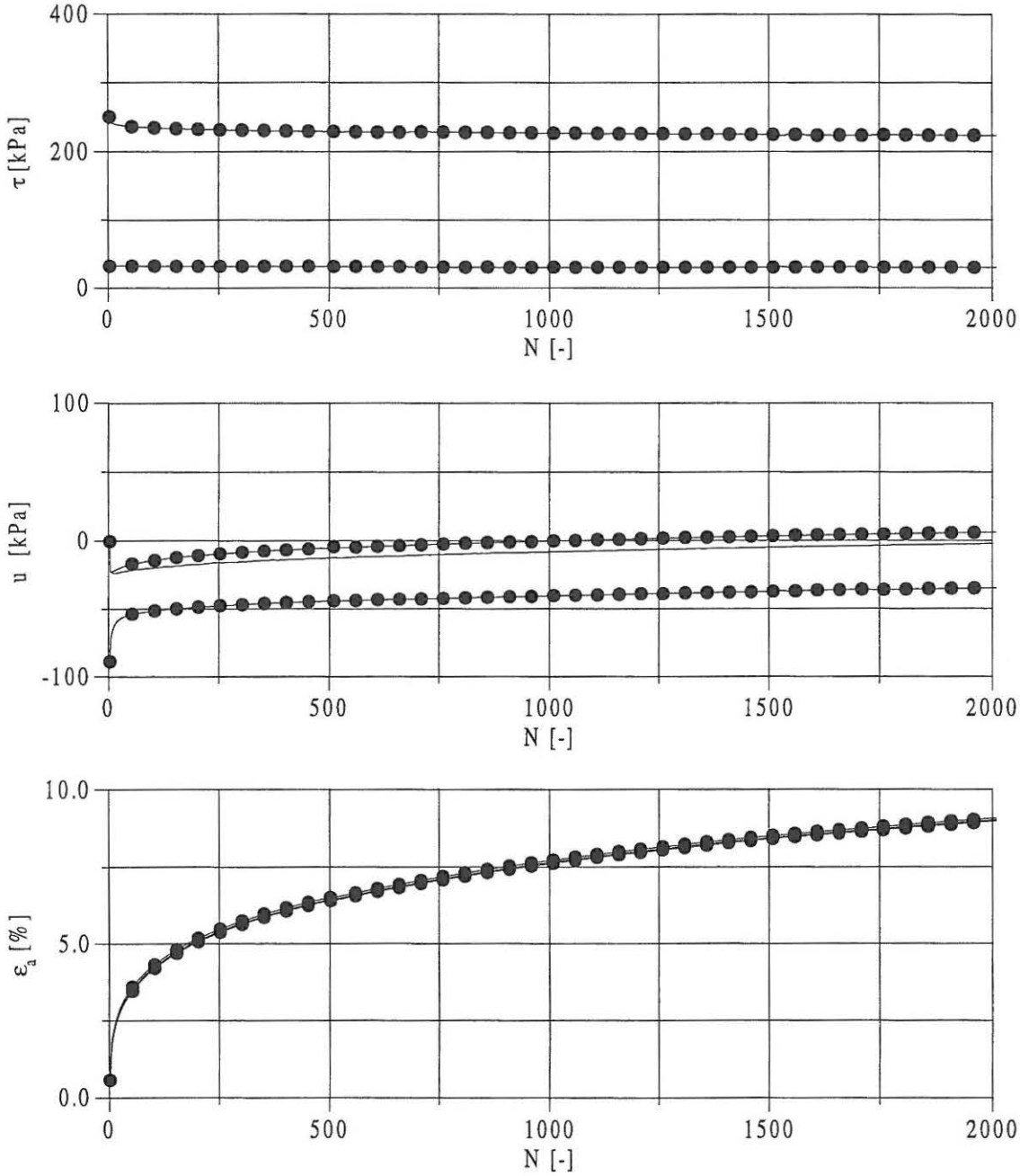
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 10
Evaluated: KPJ	Checked: KPJ



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 10
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- — Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 10
Evaluated: KPJ	Checked: KPJ

Cyclic Triaxial Test No. 9701.42

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm]	71.50	71.45	63.73
		Diameter [mm]	69.70	69.65	73.39
Calibration file Cal.dat	Date 1997-12-09	Void ratio	0.689	0.686	0.670
		B-value		0.980	

Test program			
	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	175.0	kPa
	Loading rate:	5.0	kPa/min
	☐ Applied drained		
	☒ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	150.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	425.7	kPa
Pore pressure (u)	300.1	kPa
Axial strain (ε_a)	0.12	%
Volumetric strain (ε_v)	0.46	%

Anisotropic compression		
Shear stress (τ_o)	63.0	kPa
Confining pressure (σ_r)	424.8	kPa
Pore pressure (u)	300.0	kPa
Axial strain (ε_a)	0.37	%
Volumetric strain (ε_v)	0.63	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 11
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.65	%
Volumetric strain (ε_v)	0.96	%

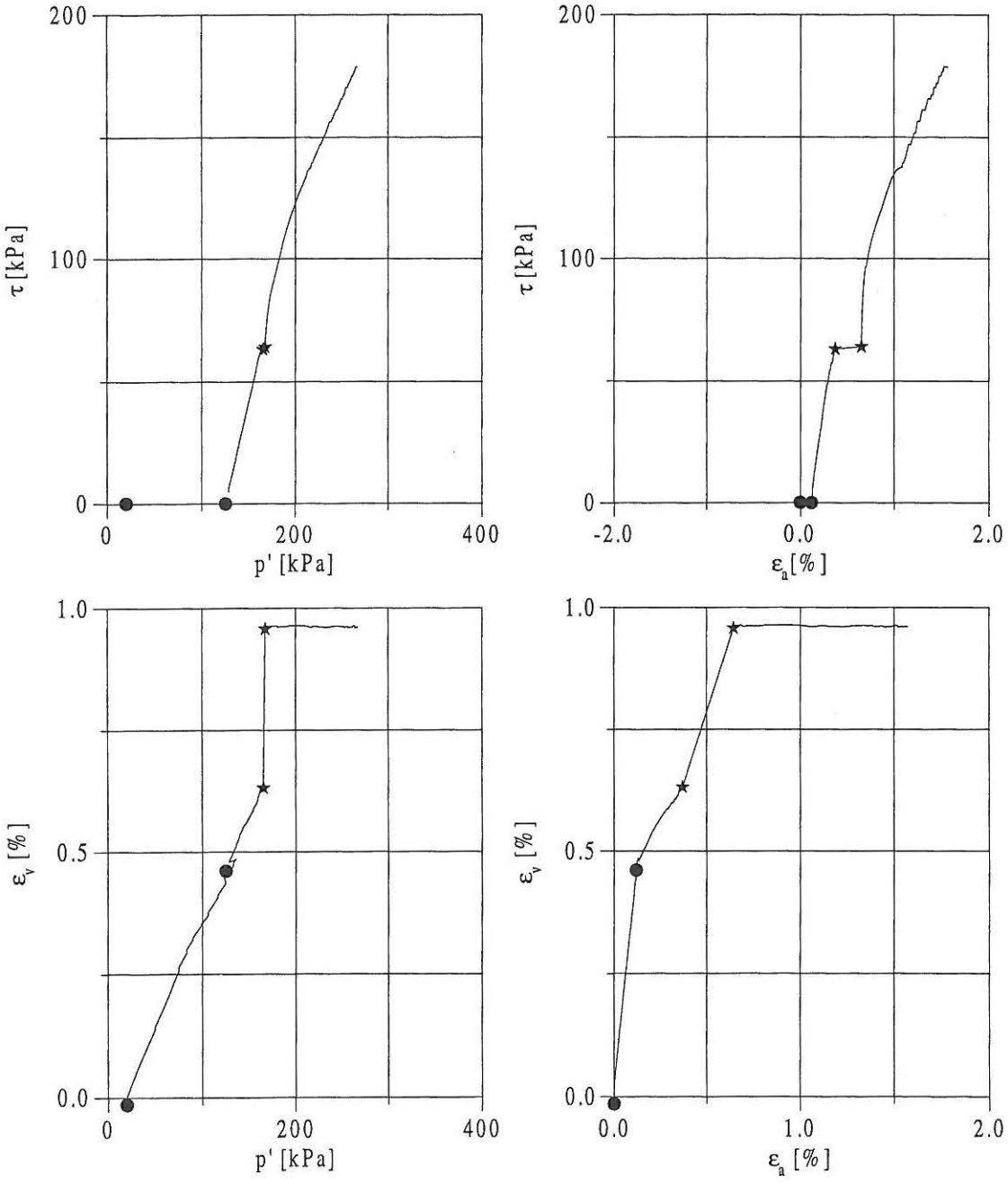
Anisotropic compression	Local	Global	
Shear stress (τ_a)		178.7	kPa
Confining pressure (σ_r)		425.0	kPa
Pore pressure (u)		278.0	kPa
Axial strain (ε_a)	0.92	1.57	%
Volumetric strain (ε_v)	0.00	0.96	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-44.7	-51.3	-54.2	-57.2	-57.8	kPa
Cyclic pore pressure (u^{cyc})	65.9	35.7	30.1	25.6	24.6	kPa
Permanent axial strain (ε_a^p)	1.92	2.71	3.20	3.97	4.67	%
Cyclic axial strain (ε_a^{cyc})	0.57	0.13	0.12	0.11	0.10	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	-56.4	-52.4	-46.8	-37.9	-39.7	kPa
Cyclic pore pressure (u^{cyc})	24.8	25.8	26.5	26.8	27.6	kPa
Permanent axial strain (ε_a^p)	5.48	6.74	7.98	8.95	9.67	%
Cyclic axial strain (ε_a^{cyc})	0.09	0.09	0.08	0.09	0.08	%
	N=1132	N=1200				
Permanent pore pressure (u^p)	-38.3	-37.9				kPa
Cyclic pore pressure (u^{cyc})	27.4	27.8				kPa
Permanent axial strain (ε_a^p)	10.00	10.15				%
Cyclic axial strain (ε_a^{cyc})	0.08	0.08				%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 11
Evaluated: KPJ	Checked: KPJ

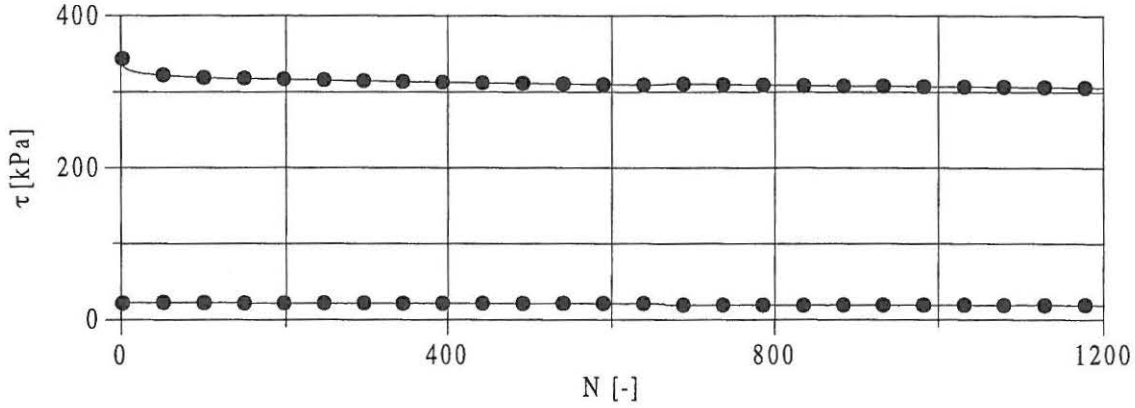
Cyclic Triaxial Test No. 9701.42

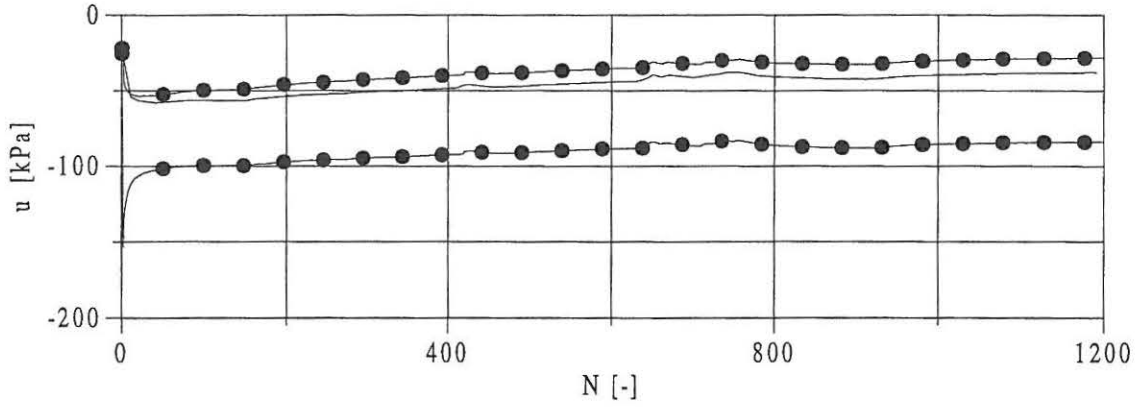


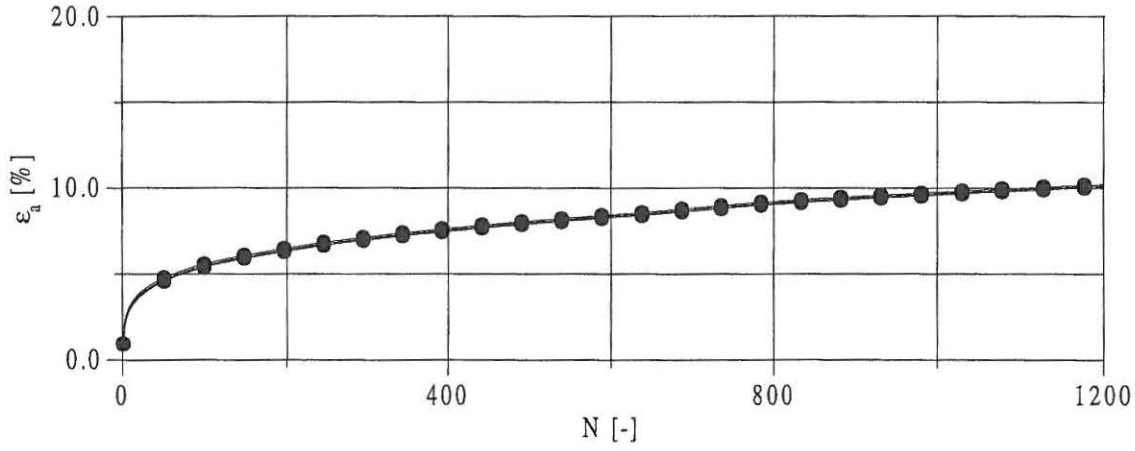
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 11
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- — Anisotropic compression
- ★ Precycling







Remarks

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 11
Evaluated: KPJ	Checked: KPJ

Cyclic Triaxial Test No. 9701.43

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm]	71.50	71.49	
		Diameter [mm]	69.70	69.69	
Calibration file Cal.dat	Date 1997-12-08	Void ratio	0.691	0.690	
		B-value		1.000	

Test program			
	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	-25.0	kPa
	Loading rate:	5.0	kPa/min
	☐ Applied drained		
	☒ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	37.5	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	427.2	kPa
Pore pressure (u)	302.2	kPa
Axial strain (ε_a)	0.11	%
Volumetric strain (ε_v)	0.44	%

Anisotropic compression		
Shear stress (τ_o)	63.5	kPa
Confining pressure (σ_r)	427.2	kPa
Pore pressure (u)	302.2	kPa
Axial strain (ε_a)	0.37	%
Volumetric strain (ε_v)	0.58	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 12
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.66	%
Volumetric strain (ε_v)	0.72	%

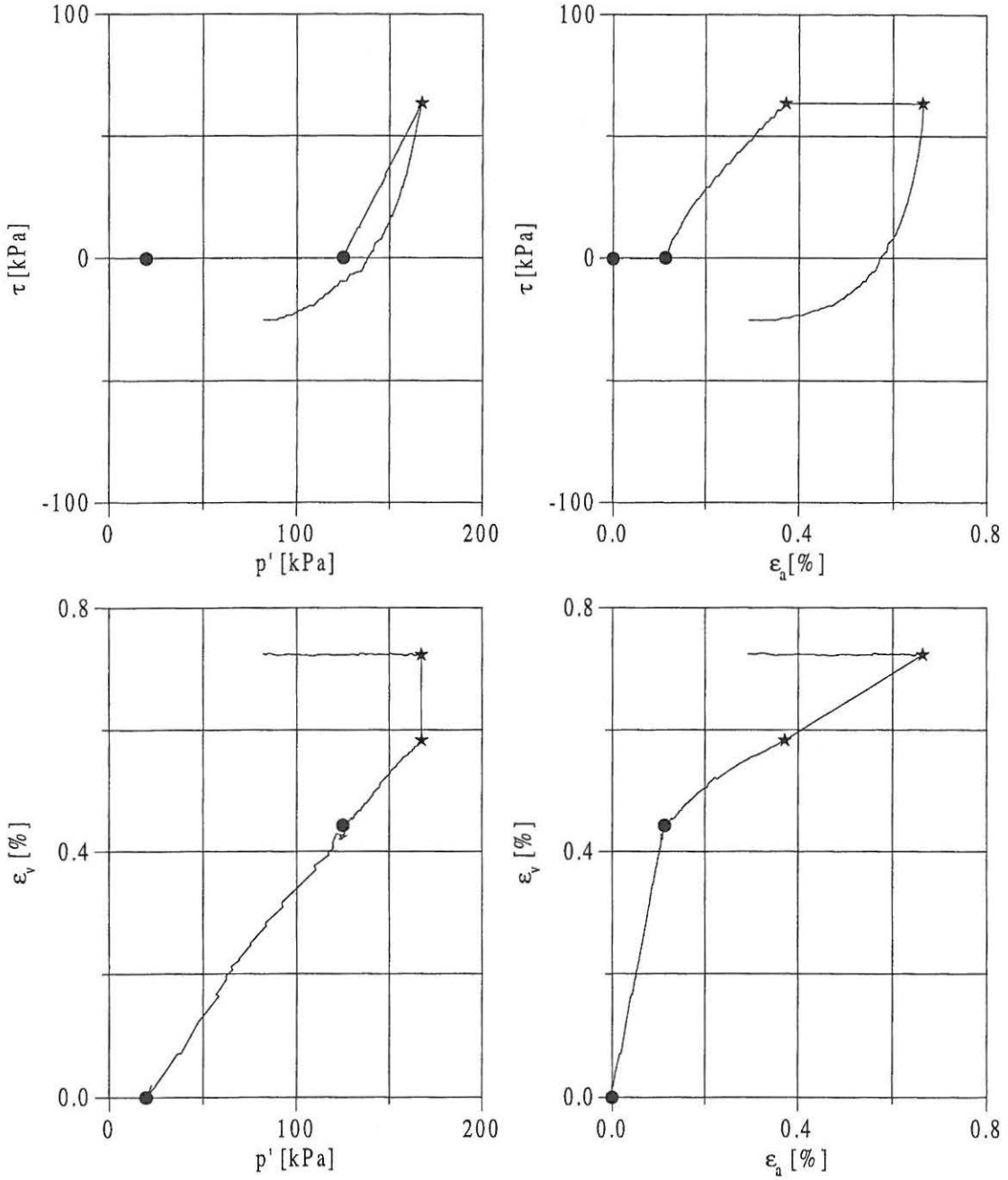
Anisotropic compression	Local	Global	
Shear stress (τ_a)		-25.3	kPa
Confining pressure (σ_r)		427.2	kPa
Pore pressure (u)		328.0	kPa
Axial strain (ε_a)	-0.37	0.29	%
Volumetric strain (ε_v)	0.00	0.72	%

Cyclic loading	N=1	N=4	N=5	
Permanent pore pressure (u^p)	-6.2	2.3	-0.4	kPa
Cyclic pore pressure (u^{cyc})	87.5	167.5	176.2	kPa
Permanent axial strain (ε_a^p)	-4.02	-10.05	-11.75	%
Cyclic axial strain (ε_a^{cyc})	1.93	3.97	4.40	%
Permanent pore pressure (u^p)				kPa
Cyclic pore pressure (u^{cyc})				kPa
Permanent axial strain (ε_a^p)				%
Cyclic axial strain (ε_a^{cyc})				%
Permanent pore pressure (u^p)				kPa
Cyclic pore pressure (u^{cyc})				kPa
Permanent axial strain (ε_a^p)				%
Cyclic axial strain (ε_a^{cyc})				%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 12
Evaluated: KPJ	Checked: KPJ

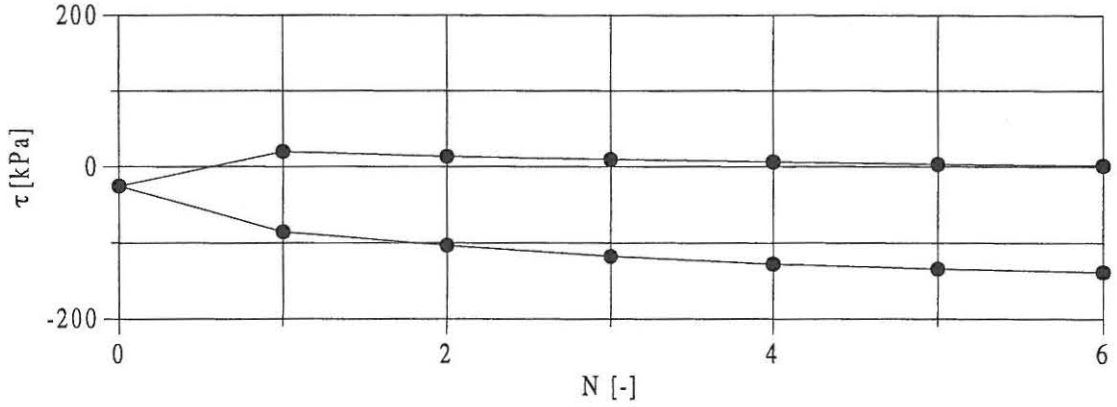
Cyclic Triaxial Test No. 9701.43

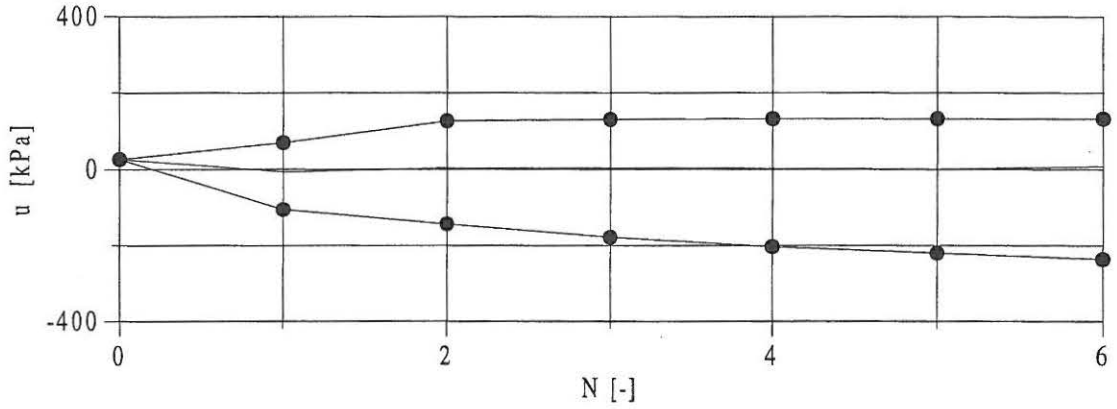


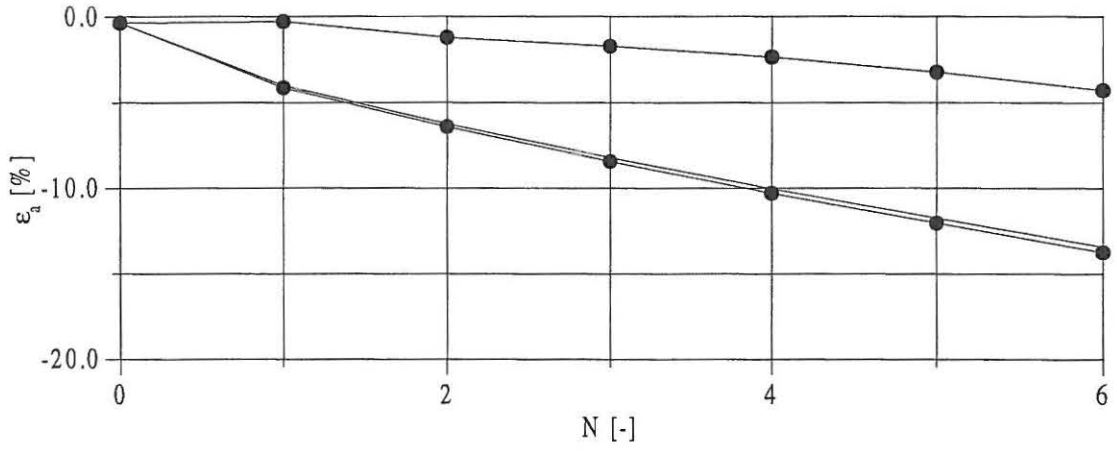
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 12
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling







Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 12 Checked: KPJ

Cyclic Triaxial Test No. 9701.44

Description of soil Oosterschelde Sand			Before test	Start test	After test
Cyclic Triaxial Apparatus		Dimension Height [mm] Diameter [mm]	71.50 69.70	71.48 69.68	
Calibration file Cal.dat	Date 1997-12-09	Void ratio B-value	0.691	0.689 0.977	

Test program	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	-50.0	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	45.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	531.7	kPa
Pore pressure (u)	406.6	kPa
Axial strain (ε_a)	0.13	%
Volumetric strain (ε_v)	0.40	%

Anisotropic compression		
Shear stress (τ_o)	63.0	kPa
Confining pressure (σ_r)	531.7	kPa
Pore pressure (u)	406.7	kPa
Axial strain (ε_a)	0.41	%
Volumetric strain (ε_v)	0.56	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 13
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.66	%
Volumetric strain (ε_v)	0.66	%

Anisotropic compression	Local	Global	
Shear stress (τ_a)		-49.5	kPa
Confining pressure (σ_r)		532.2	kPa
Pore pressure (u)		407.1	kPa
Axial strain (ε_a)	-4.67	-4.01	%
Volumetric strain (ε_v)	-0.71	-0.05	%

Cyclic loading	N=1	N=5	N=10	N=25	N=33	
Permanent pore pressure (u^p)	-64.9	-62.9	-64.6	-72.9	-79.9	kPa
Cyclic pore pressure (u^{cyc})	130.9	125.7	123.7	122.4	124.3	kPa
Permanent axial strain (ε_a^p)	-7.00	-8.76	-10.17	-12.98	-14.18	%
Cyclic axial strain (ε_a^{cyc})	0.67	0.49	0.42	0.38	0.37	%

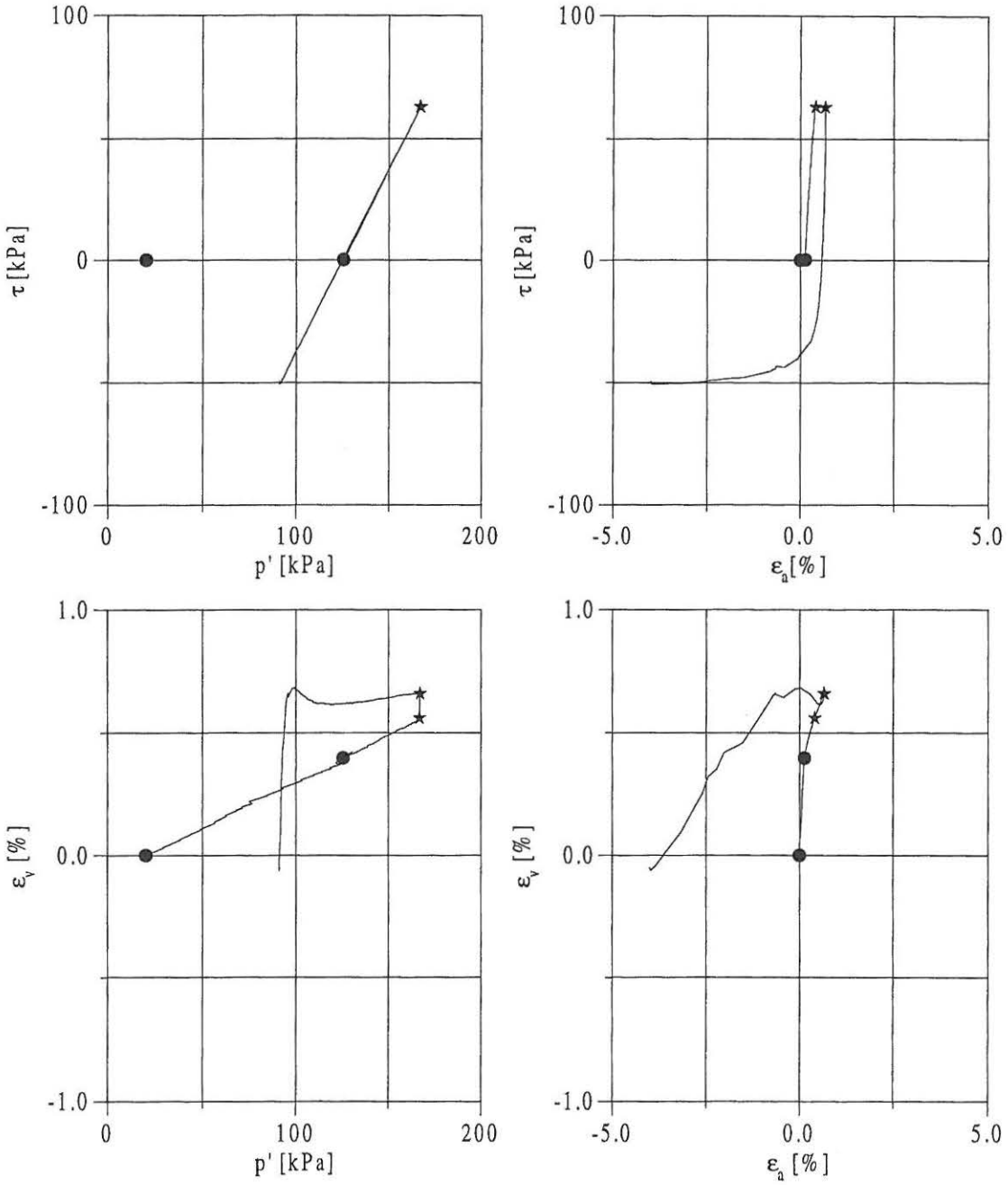
Permanent pore pressure (u^p)	kPa
Cyclic pore pressure (u^{cyc})	kPa
Permanent axial strain (ε_a^p)	%
Cyclic axial strain (ε_a^{cyc})	%

Permanent pore pressure (u^p)	kPa
Cyclic pore pressure (u^{cyc})	kPa
Permanent axial strain (ε_a^p)	%
Cyclic axial strain (ε_a^{cyc})	%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 13
Evaluated: KPJ	Checked: KPJ

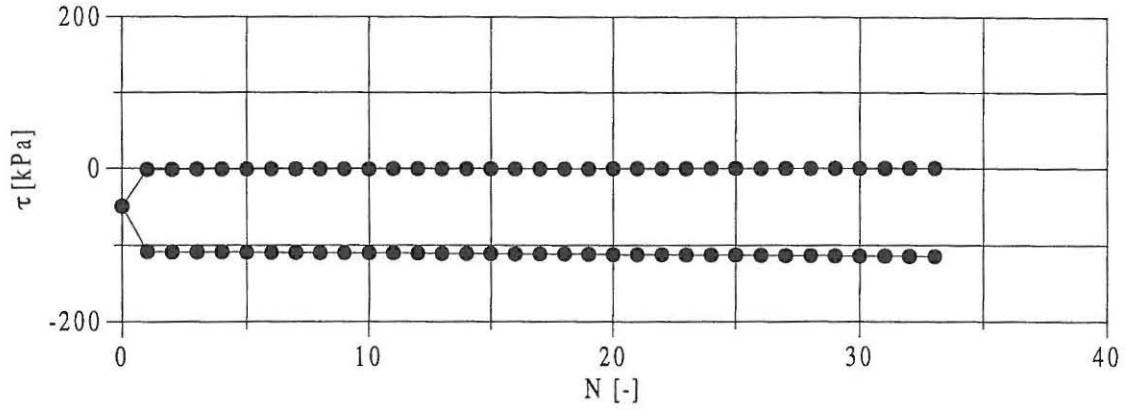
Cyclic Triaxial Test No. 9701.44

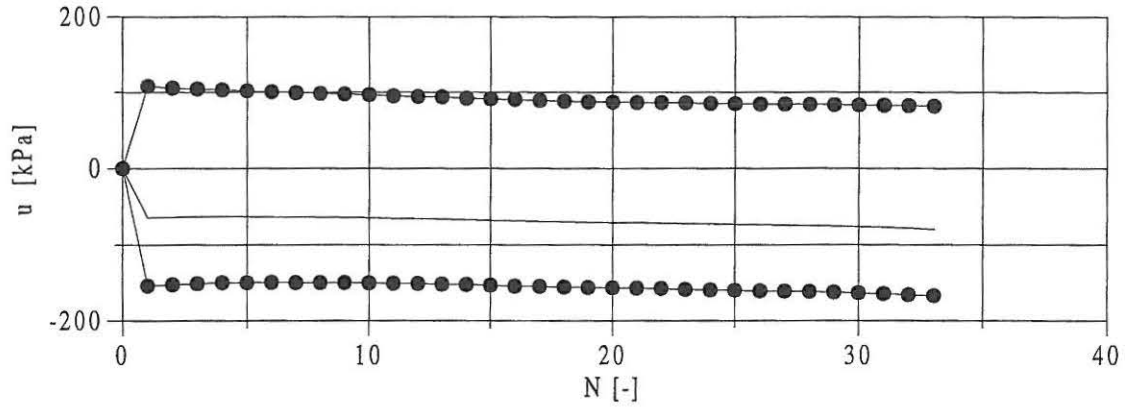


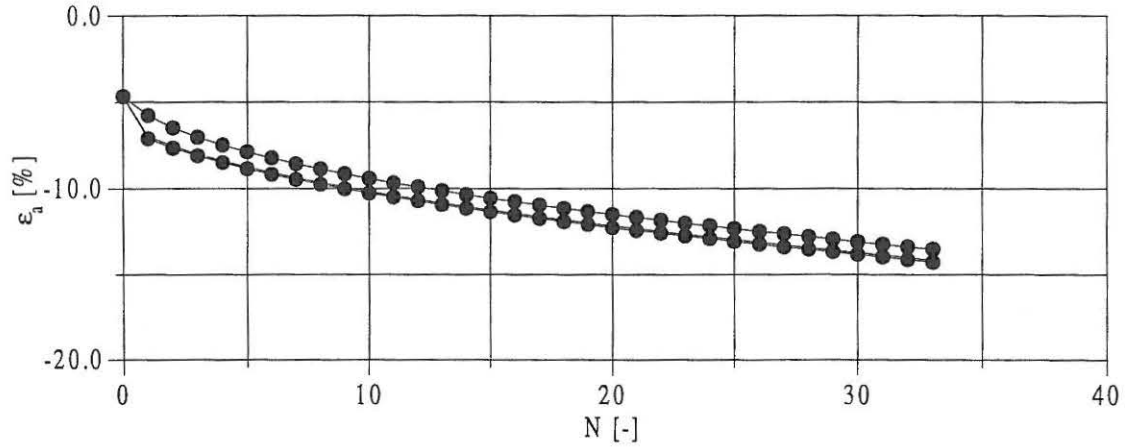
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 13
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling







Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 13 Checked: KPJ

Cyclic Triaxial Test No. 9701.45

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm] Diameter [mm]	71.50 69.70	71.51 69.71	65.47 72.61
Calibration file Cal.dat	Date 1997-12-10	Void ratio B-value	0.691	0.692 0.973	0.680

Test program			
	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	137.5	kPa
	Loading rate:	5.0	kPa/min
	☐ Applied drained		
	☒ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	100.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	325.1	kPa
Pore pressure (u)	200.1	kPa
Axial strain (ε_a)	0.11	%
Volumetric strain (ε_v)	0.40	%

Anisotropic compression		
Shear stress (τ_o)	63.1	kPa
Confining pressure (σ_r)	325.1	kPa
Pore pressure (u)	200.0	kPa
Axial strain (ε_a)	0.38	%
Volumetric strain (ε_v)	0.54	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 14
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.83	%
Volumetric strain (ε_v)	0.66	%

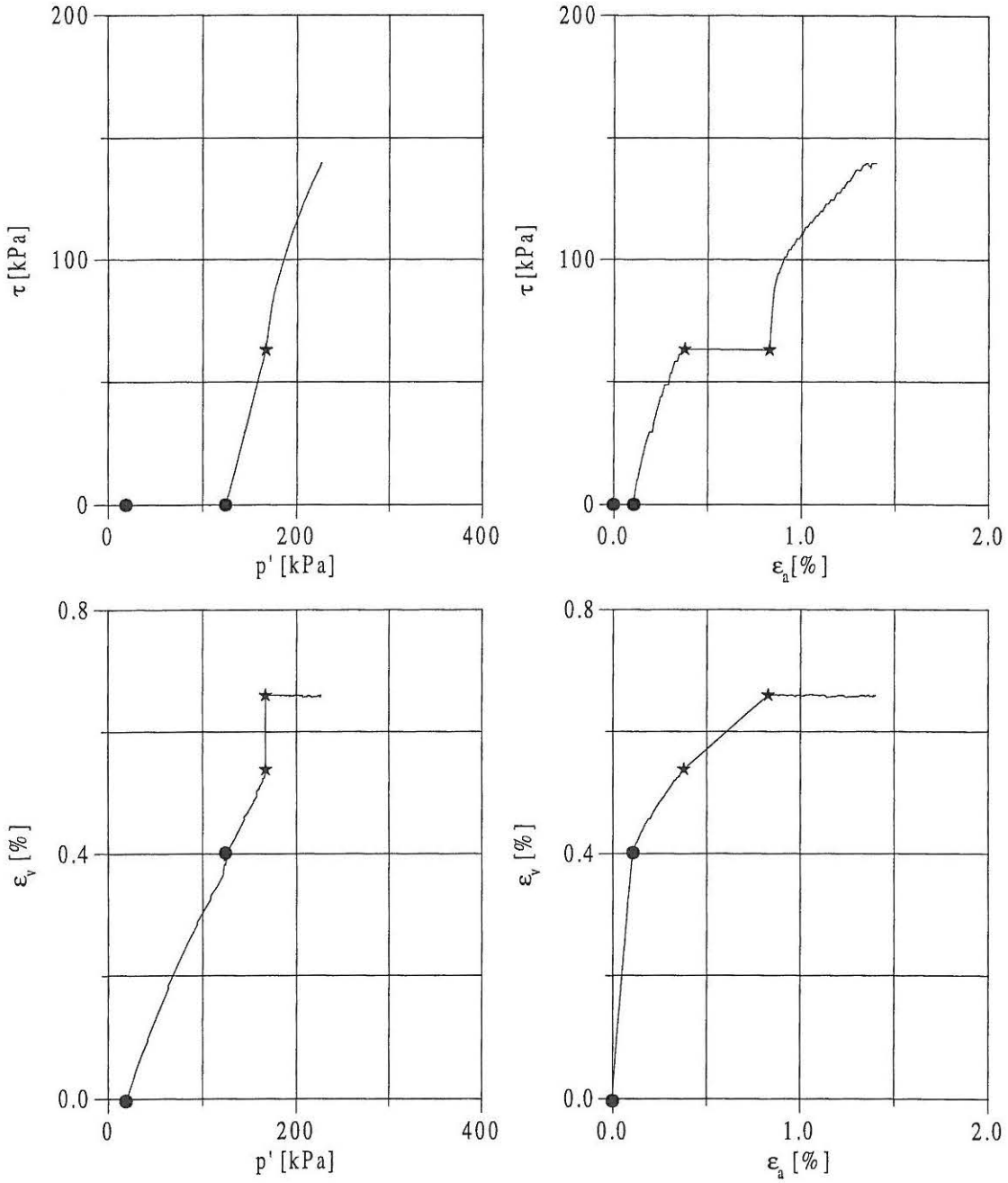
Anisotropic compression	Local	Global	
Shear stress (τ_a)		139.1	kPa
Confining pressure (σ_r)		325.1	kPa
Pore pressure (u)		192.0	kPa
Axial strain (ε_a)	0.57	1.40	%
Volumetric strain (ε_v)	0.00	0.66	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-31.2	-31.0	-30.2	-29.7	-29.1	kPa
Cyclic pore pressure (u^{cyc})	42.6	20.8	18.7	17.1	16.7	kPa
Permanent axial strain (ε_a^p)	1.38	1.92	2.25	2.82	3.33	%
Cyclic axial strain (ε_a^{cyc})	0.46	0.10	0.08	0.08	0.07	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	-27.4	-25.5	21.8	-19.5	-18.4	kPa
Cyclic pore pressure (u^{cyc})	16.8	17.5	17.9	18.1	18.5	kPa
Permanent axial strain (ε_a^p)	3.93	4.82	5.59	6.09	6.44	%
Cyclic axial strain (ε_a^{cyc})	0.07	0.06	0.06	0.06	0.06	%
	N=1250	N=1500	N=1750	N=2000		
Permanent pore pressure (u^p)	-16.7	-15.7	-14.1	-13.2		kPa
Cyclic pore pressure (u^{cyc})	19.0	19.1	19.3	19.4		kPa
Permanent axial strain (ε_a^p)	6.81	7.12	7.38	7.61		%
Cyclic axial strain (ε_a^{cyc})	0.06	0.06	0.06	0.06		%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 14 Checked: KPJ

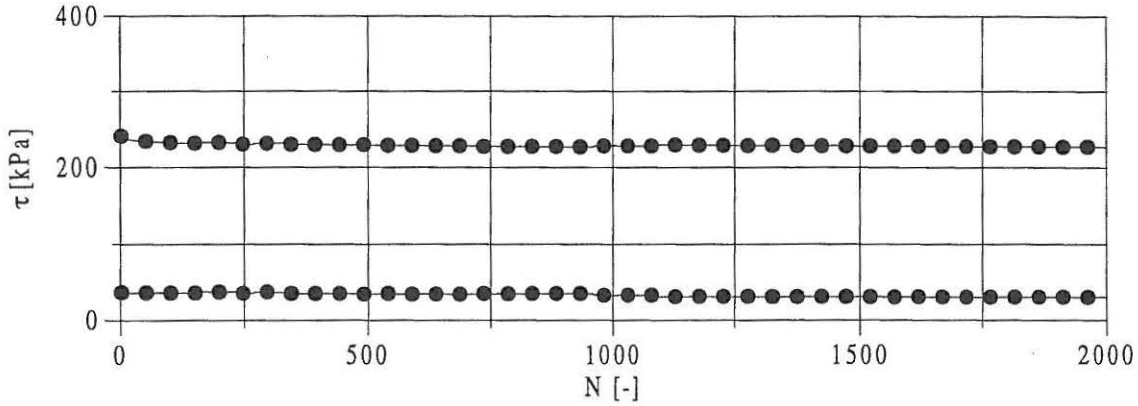
Cyclic Triaxial Test No. 9701.45

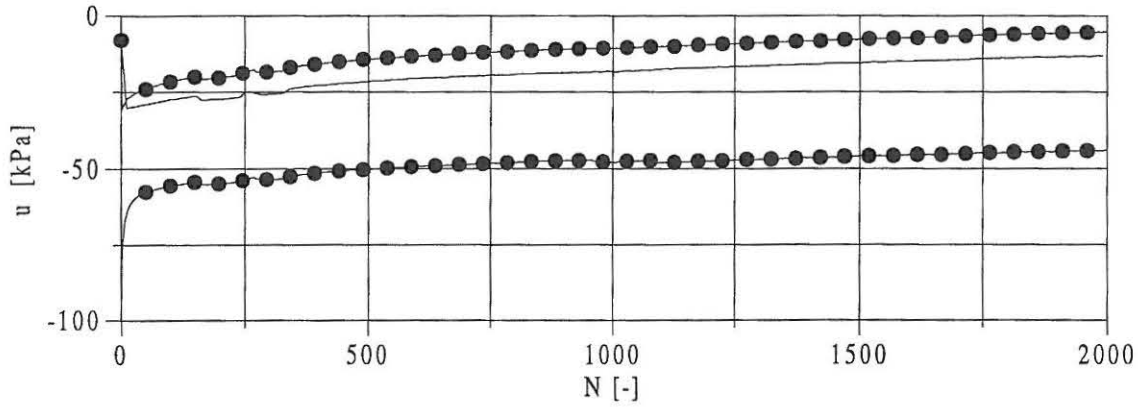


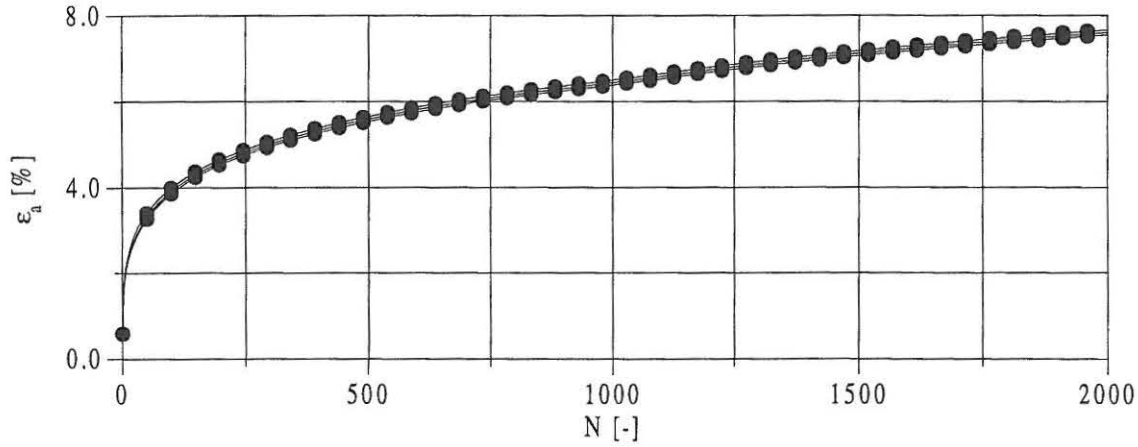
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 14
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- — Anisotropic compression
- ★ Precycling







Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 14 Checked: KPJ

Cyclic Triaxial Test No. 9701.46

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm]	71.50	71.50	60.85
		Diameter [mm]	69.70	69.70	75.46
Calibration file Cal.dat	Date 1997-12-11	Void ratio	0.690	0.690	0.686
		B-value		0.980	

Test program			
	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	175.0	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	150.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	424.9	kPa
Pore pressure (u)	399.9	kPa
Axial strain (ε_a)	0.09	%
Volumetric strain (ε_v)	0.40	%

Anisotropic compression		
Shear stress (τ_o)	62.4	kPa
Confining pressure (σ_r)	425.0	kPa
Pore pressure (u)	399.9	kPa
Axial strain (ε_a)	0.30	%
Volumetric strain (ε_v)	0.54	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 15
Evaluated: KPJ	Checked: KPJ

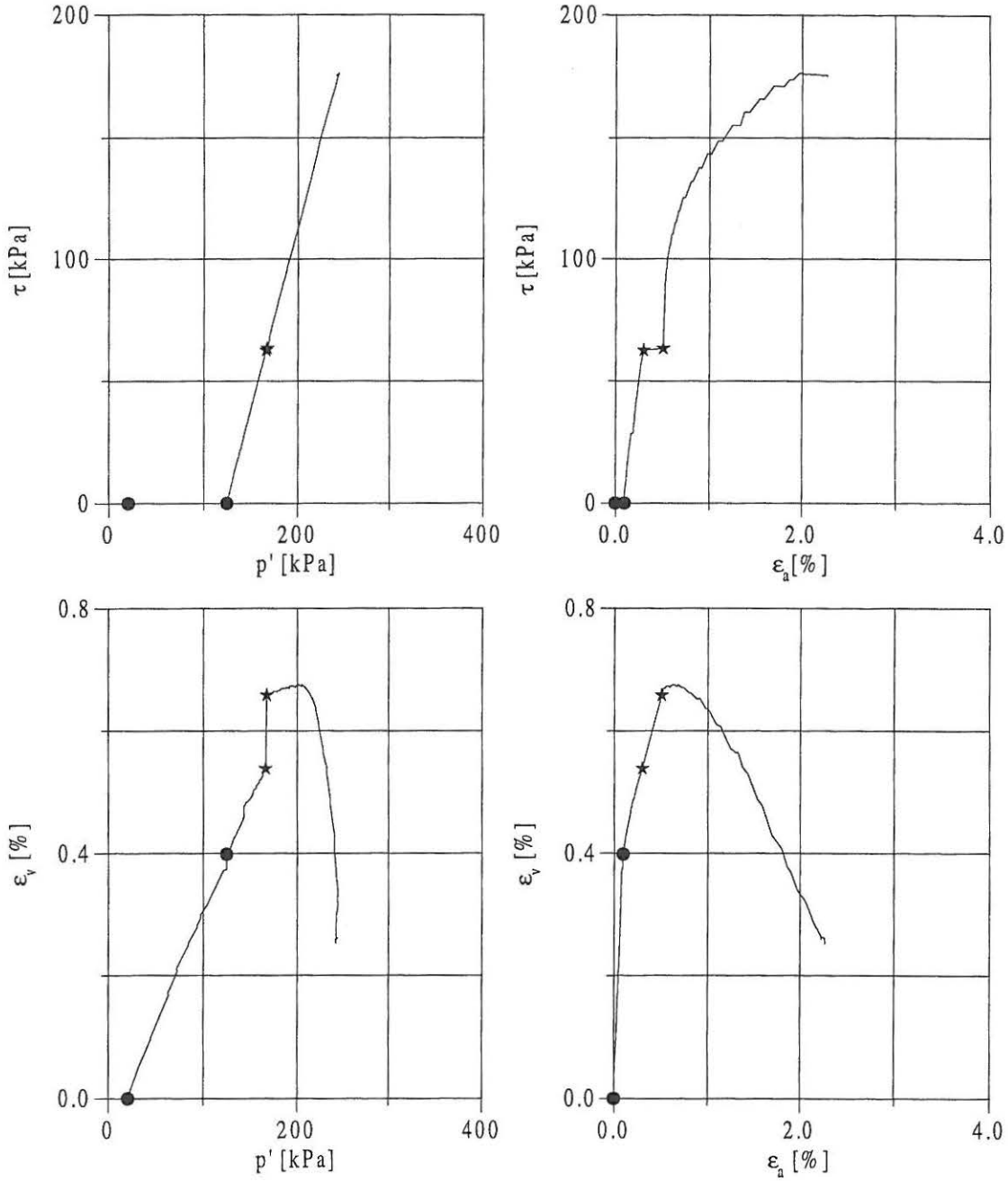
Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.50	%
Volumetric strain (ε_v)	0.66	%

Anisotropic compression	Local	Global	
Shear stress (τ_a)		175.4	kPa
Confining pressure (σ_r)		526.2	kPa
Pore pressure (u)		401.2	kPa
Axial strain (ε_a)	1.77	2.27	%
Volumetric strain (ε_v)	-0.41	0.25	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-8.0	-18.3	-23.5	-30.0	-34.1	kPa
Cyclic pore pressure (u^{cyc})	71.1	48.0	40.2	17.1	27.8	kPa
Permanent axial strain (ε_a^p)	2.72	3.80	4.49	5.67	6.78	%
Cyclic axial strain (ε_a^{cyc})	0.54	0.17	0.13	0.12	0.11	%
	N=100	N=226	N=250	N=500	N=750	
Permanent pore pressure (u^p)	-38.2	-40.8	-40.7	-38.6	-35.8	kPa
Cyclic pore pressure (u^{cyc})	25.2	25.5	25.5	26.5	27.0	kPa
Permanent axial strain (ε_a^p)	8.12	10.01	10.26	12.22	13.55	%
Cyclic axial strain (ε_a^{cyc})	0.10	0.09	0.09	0.08	0.07	%
	N=950					
Permanent pore pressure (u^p)	-33.7					kPa
Cyclic pore pressure (u^{cyc})	27.2					kPa
Permanent axial strain (ε_a^p)	14.40					%
Cyclic axial strain (ε_a^{cyc})	0.07					%

Remarks:

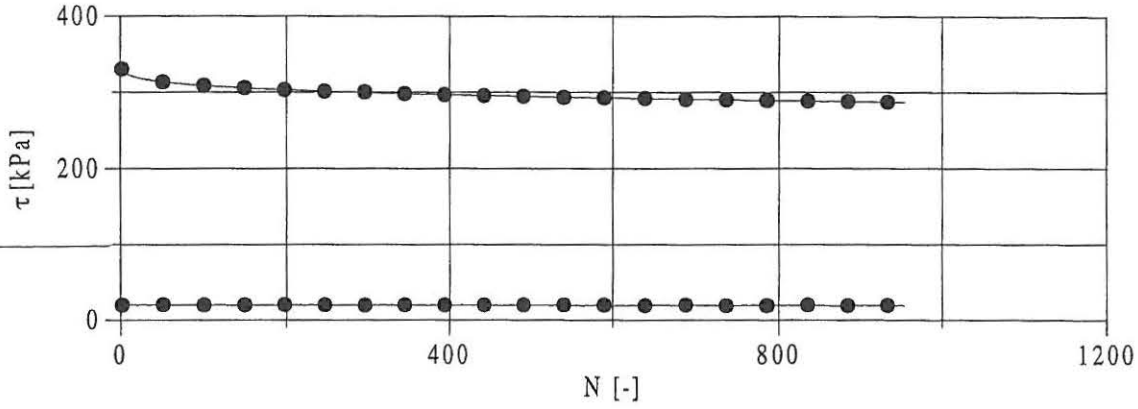
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 15
Evaluated: KPJ	Checked: KPJ

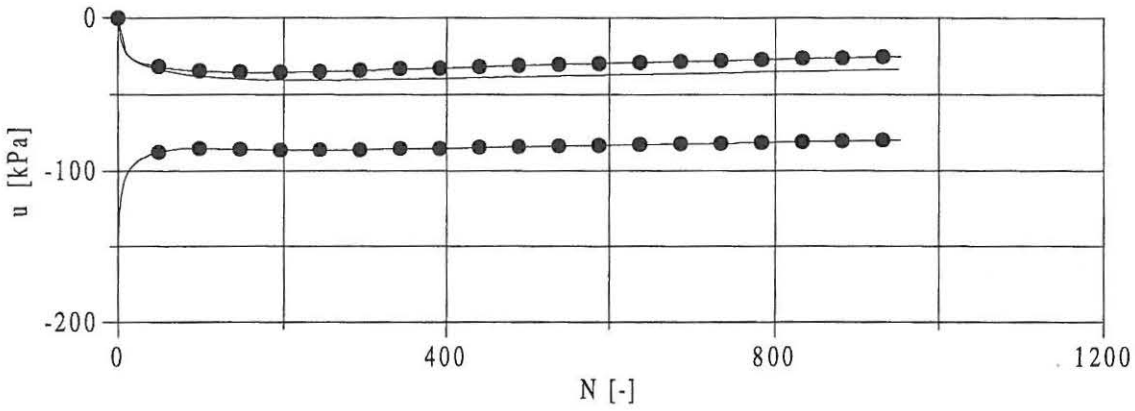


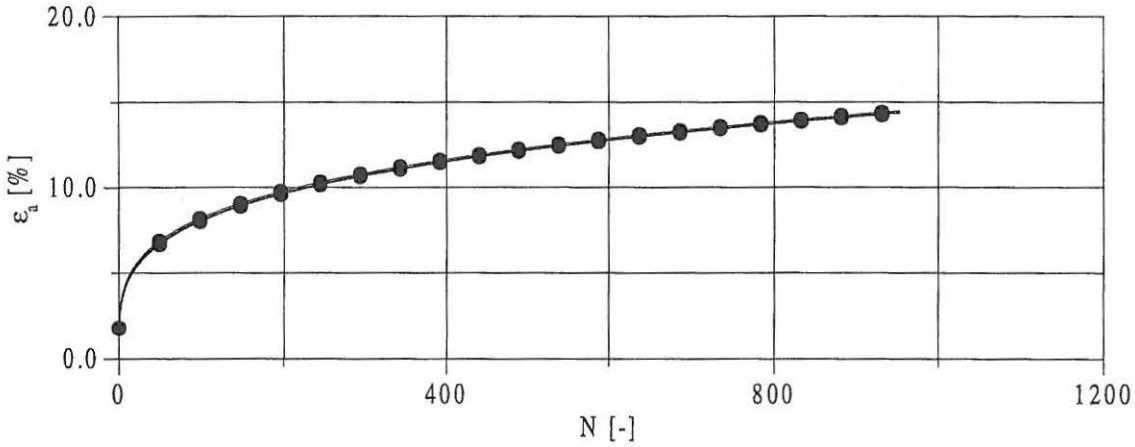
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 15
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling







Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 15 Checked: KPJ

Cyclic Triaxial Test No. 9701.47

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm]	71.50	71.45	
		Diameter [mm]	69.70	69.65	
Calibration file Cal.dat	Date 1997-12-11	Void ratio	0.691	0.687	
		B-value		0.970	

Test program			
	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	-25.0	kPa
	Loading rate:	5.0	kPa/min
	☐ Applied drained		
	☒ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	62.5	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	524.8	kPa
Pore pressure (u)	399.8	kPa
Axial strain (ε_a)	0.11	%
Volumetric strain (ε_v)	0.46	%

Anisotropic compression		
Shear stress (τ_o)	62.5	kPa
Confining pressure (σ_r)	524.9	kPa
Pore pressure (u)	399.8	kPa
Axial strain (ε_a)	0.37	%
Volumetric strain (ε_v)	0.63	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 16
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.63	%
Volumetric strain (ε_v)	0.77	%

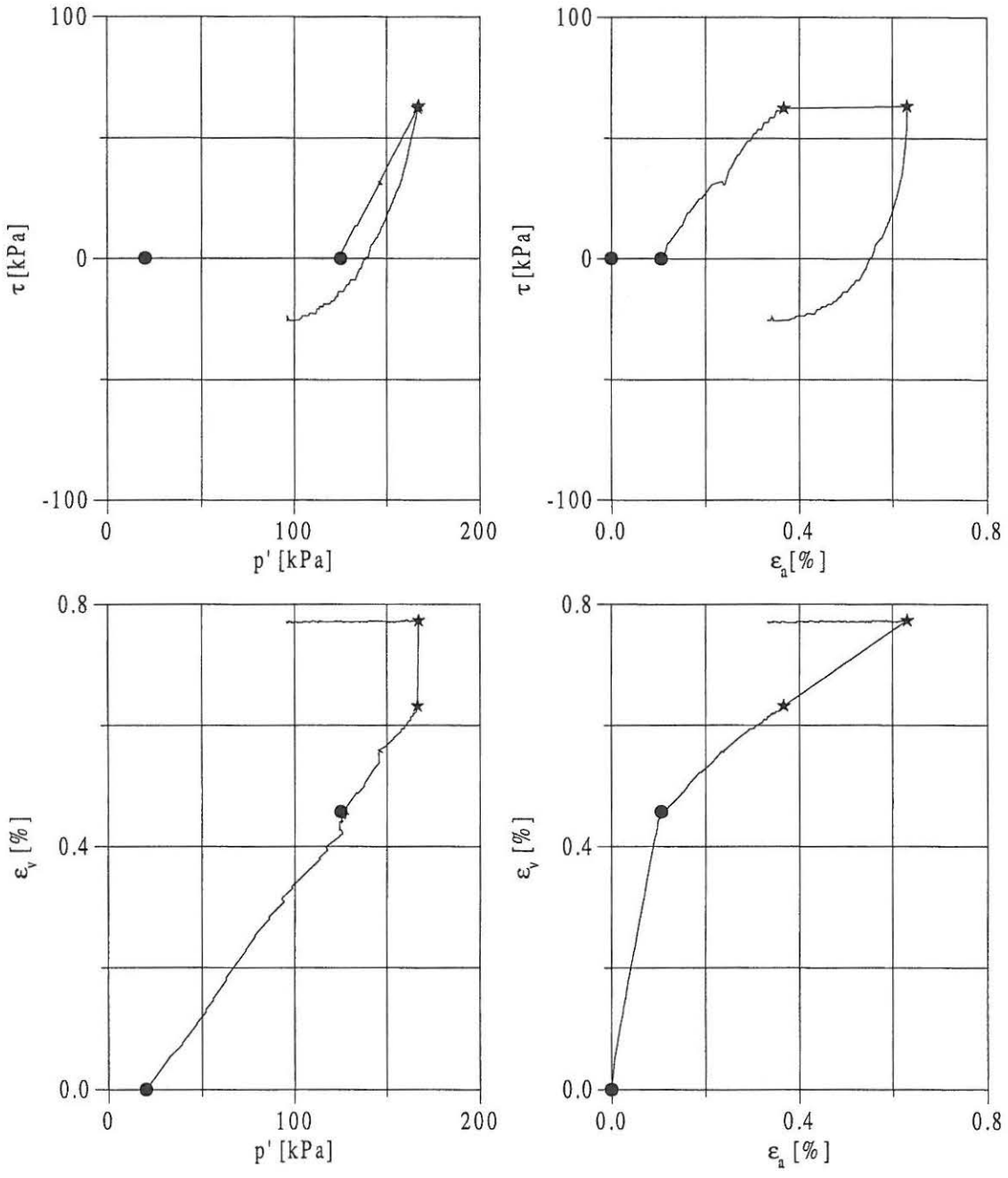
Anisotropic compression	Local	Global	
Shear stress (τ_a)		-25.4	kPa
Confining pressure (σ_r)		525.5	kPa
Pore pressure (u)		412.5	kPa
Axial strain (ε_a)	-0.30	0.33	%
Volumetric strain (ε_v)	0.00	0.77	%

Cyclic loading	N=1	N=4	N=5	
Permanent pore pressure (u^p)	-54.4	-54.6	-64.3	kPa
Cyclic pore pressure (u^{cyc})	159.5	256.8	268.8	kPa
Permanent axial strain (ε_a^p)	-5.29	-9.78	-11.46	%
Cyclic axial strain (ε_a^{cyc})	2.77	6.87	7.81	%
Permanent pore pressure (u^p)				kPa
Cyclic pore pressure (u^{cyc})				kPa
Permanent axial strain (ε_a^p)				%
Cyclic axial strain (ε_a^{cyc})				%
Permanent pore pressure (u^p)				kPa
Cyclic pore pressure (u^{cyc})				kPa
Permanent axial strain (ε_a^p)				%
Cyclic axial strain (ε_a^{cyc})				%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 16
Evaluated: KPJ	Checked: KPJ

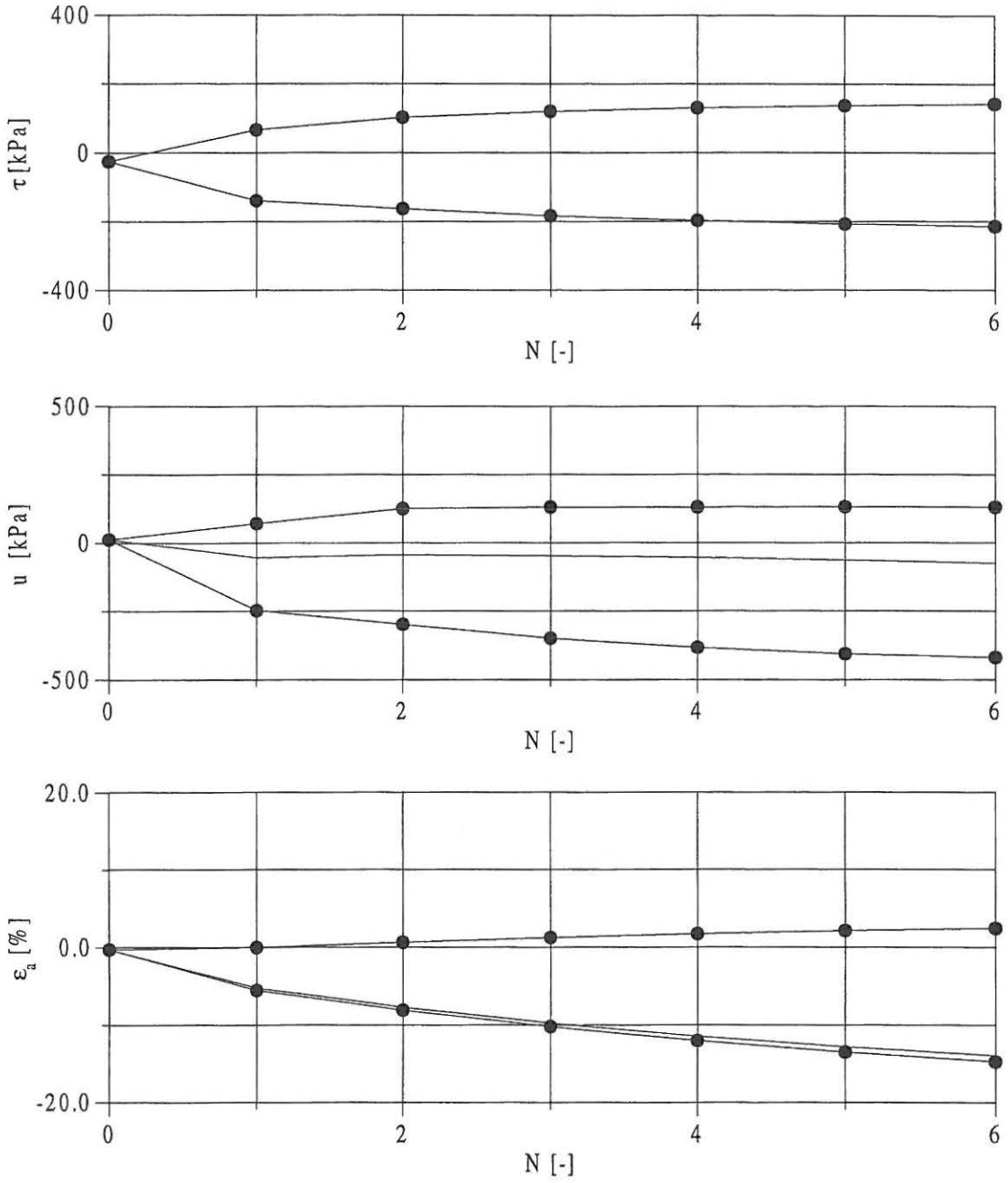
Cyclic Triaxial Test No. 9701.47



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 16
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- ——— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 16 Checked: KPJ

Cyclic Triaxial Test No. 9701.48

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm] Diameter [mm]	71.50 69.70	71.48 69.68	
Calibration file Cal.dat	Date 1997-12-18	Void ratio B-value	0.690	0.689 0.987	

Test program	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	-50.0	kPa
	Loading rate:	5.0	kPa/min
	☐ Applied drained		
	☒ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	45.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	427.1	kPa
Pore pressure (u)	302.1	kPa
Axial strain (ε_a)	0.11	%
Volumetric strain (ε_v)	0.42	%

Anisotropic compression		
Shear stress (τ_o)	63.4	kPa
Confining pressure (σ_r)	427.3	kPa
Pore pressure (u)	302.0	kPa
Axial strain (ε_a)	0.43	%
Volumetric strain (ε_v)	0.61	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 17
Evaluated: KPJ	Checked: KPJ

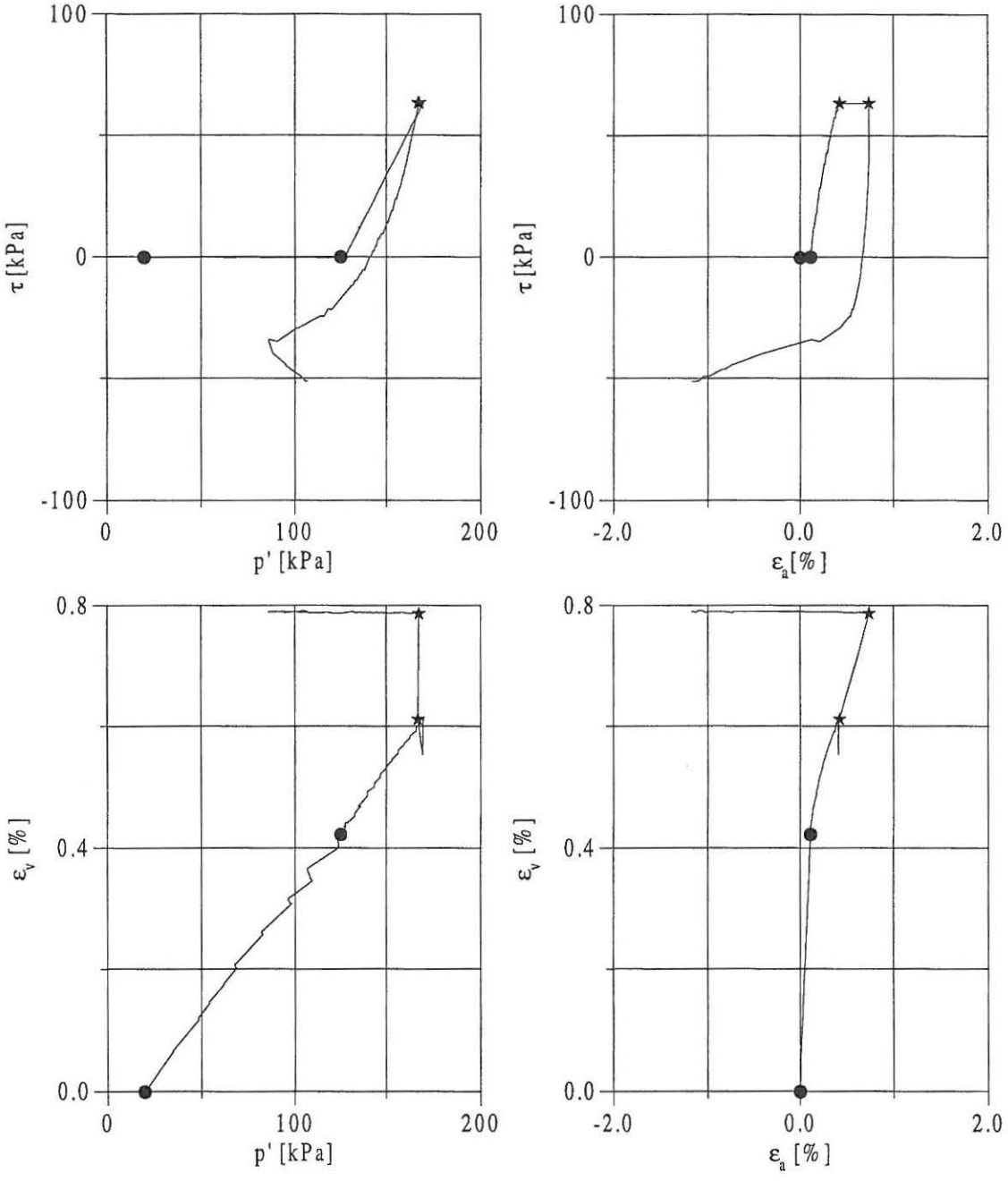
Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.74	%
Volumetric strain (ε_v)	0.79	%

Anisotropic compression	Local	Global	
Shear stress (τ_a)		-51.3	kPa
Confining pressure (σ_r)		427.5	kPa
Pore pressure (u)		286.7	kPa
Axial strain (ε_a)	-1.91	-1.17	%
Volumetric strain (ε_v)	0.00	0.79	%

Cyclic loading	N=1	N=5	N=10	N=25	N=31	
Permanent pore pressure (u^p)	-69.0	-60.4	-57.3	-56.6	-56.8	kPa
Cyclic pore pressure (u^{cyc})	120.6	118.8	116.6	114.3	113.4	kPa
Permanent axial strain (ε_a^p)	-4.53	-6.00	-7.16	-9.38	-10.04	%
Cyclic axial strain (ε_a^{cyc})	0.51	0.40	0.30	0.30	0.30	%
	N=50	N=80				
Permanent pore pressure (u^p)	-61.1	-73.3				kPa
Cyclic pore pressure (u^{cyc})	113.5	117.2				kPa
Permanent axial strain (ε_a^p)	-11.77	-13.9				%
Cyclic axial strain (ε_a^{cyc})	0.28	0.27				%
Permanent pore pressure (u^p)						kPa
Cyclic pore pressure (u^{cyc})						kPa
Permanent axial strain (ε_a^p)						%
Cyclic axial strain (ε_a^{cyc})						%

Remarks:

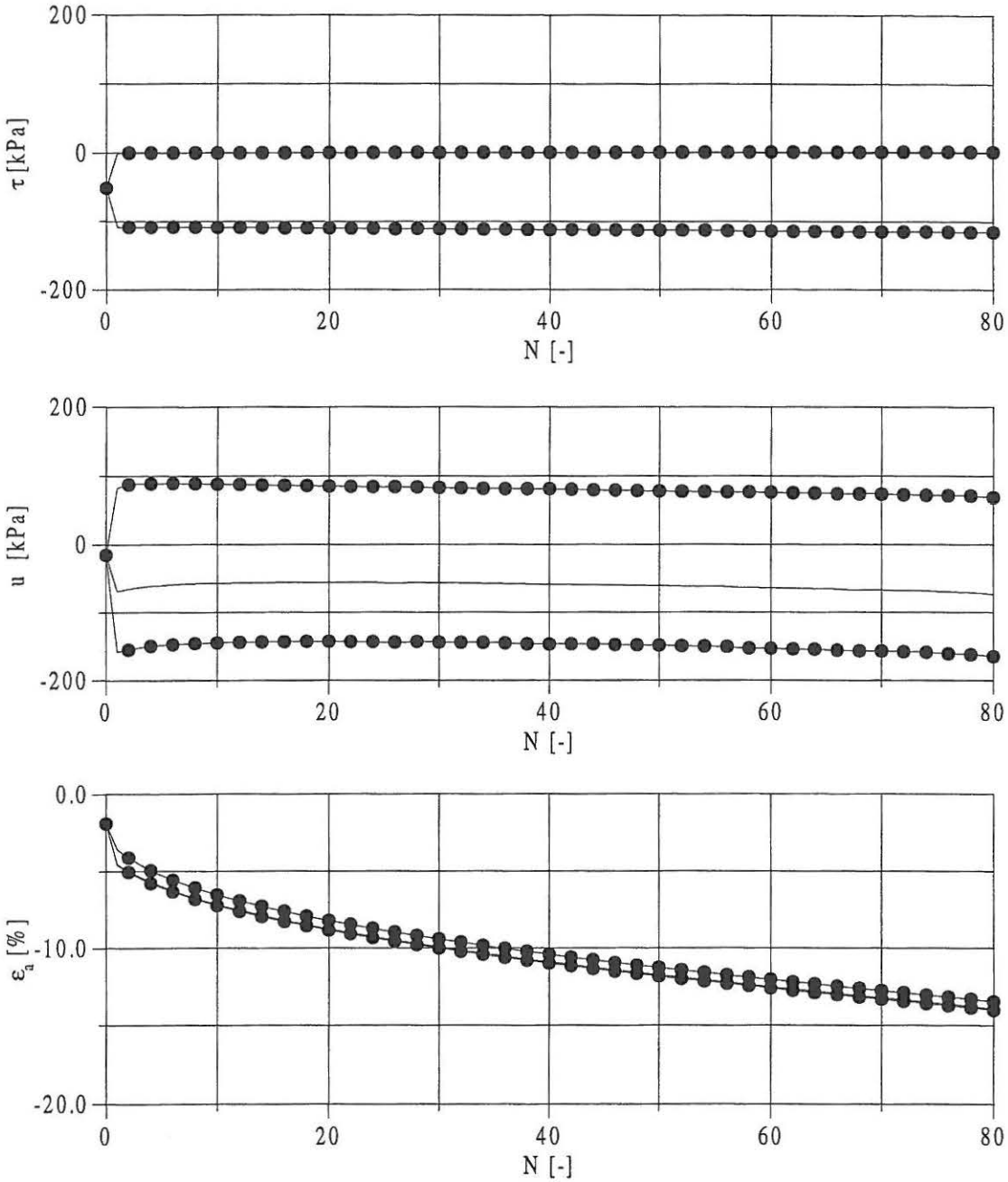
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 17
Evaluated: KPJ	Checked: KPJ



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 17
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 17 Checked: KPJ

Cyclic Triaxial Test No. 9701.49

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm] Diameter [mm]	71.50 69.70	71.42 69.62	
Calibration file Cal.dat	Date 1997-12-19	Void ratio B-value	0.691	0.685 0.993	

Test program	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	-25.0	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	37.5	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	426.6	kPa
Pore pressure (u)	301.6	kPa
Axial strain (ε_a)	0.13	%
Volumetric strain (ε_v)	0.45	%

Anisotropic compression		
Shear stress (τ_o)	62.6	kPa
Confining pressure (σ_r)	426.5	kPa
Pore pressure (u)	301.6	kPa
Axial strain (ε_a)	0.45	%
Volumetric strain (ε_v)	0.64	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 18
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.86	%
Volumetric strain (ε_v)	0.82	%

Anisotropic compression	Local	Global	
Shear stress (τ_a)		-25.3	kPa
Confining pressure (σ_r)		426.4	kPa
Pore pressure (u)		301.4	kPa
Axial strain (ε_a)	-0.25	0.61	%
Volumetric strain (ε_v)	0.00	0.82	%

Cyclic loading	N=1	N=5	N=7	N=10	
Permanent pore pressure (u^p)	-8.5	5.7	5.5	2.5	kPa
Cyclic pore pressure (u^{cyc})	70.9	161.3	172.3	183.6	kPa
Permanent axial strain (ε_a^p)	-3.03	-8.73	-11.04	-14.29	%
Cyclic axial strain (ε_a^{cyc})	1.46	3.27	3.75	4.23	%

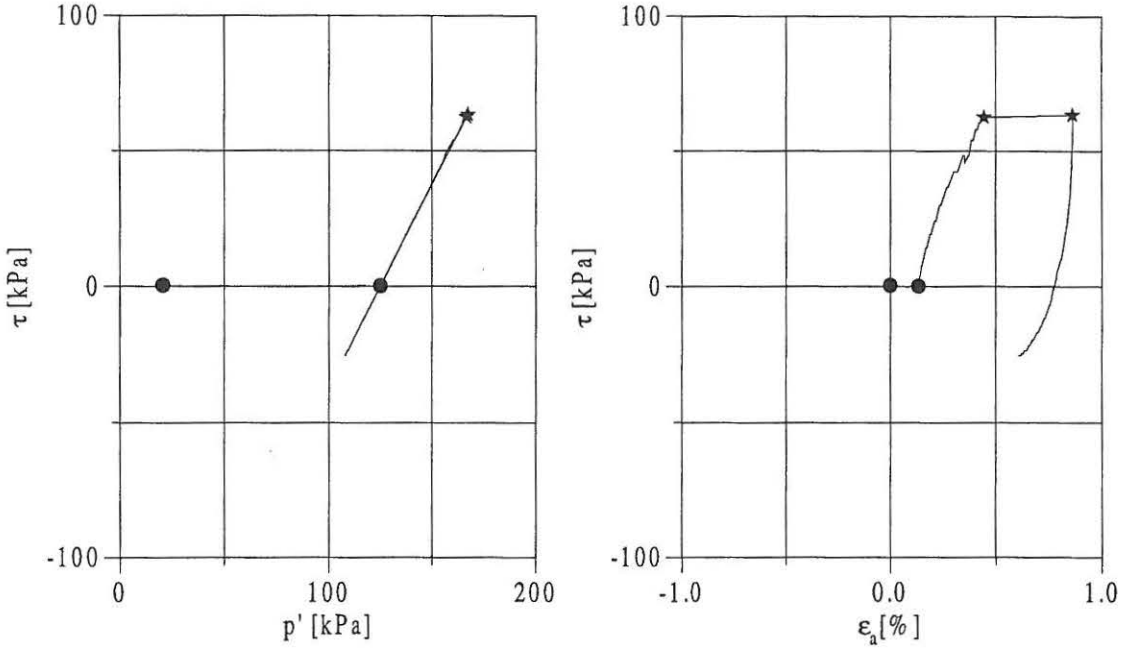
Permanent pore pressure (u^p)	kPa
Cyclic pore pressure (u^{cyc})	kPa
Permanent axial strain (ε_a^p)	%
Cyclic axial strain (ε_a^{cyc})	%

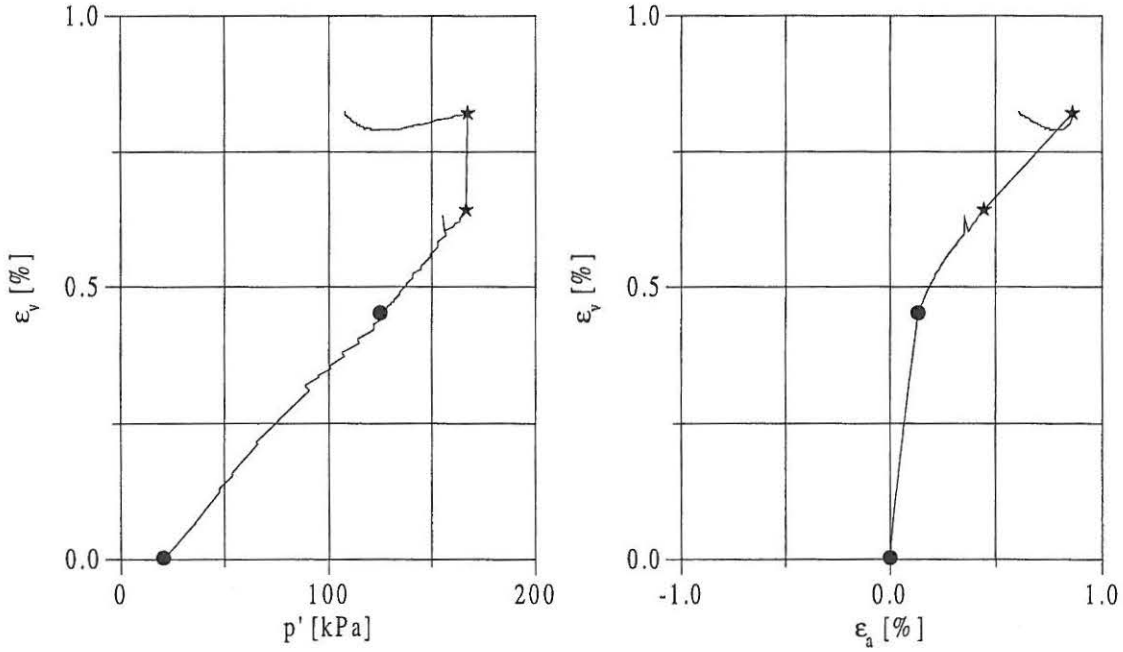
Permanent pore pressure (u^p)	kPa
Cyclic pore pressure (u^{cyc})	kPa
Permanent axial strain (ε_a^p)	%
Cyclic axial strain (ε_a^{cyc})	%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 18
Evaluated: KPJ	Checked: KPJ

Cyclic Triaxial Test No. 9701.49

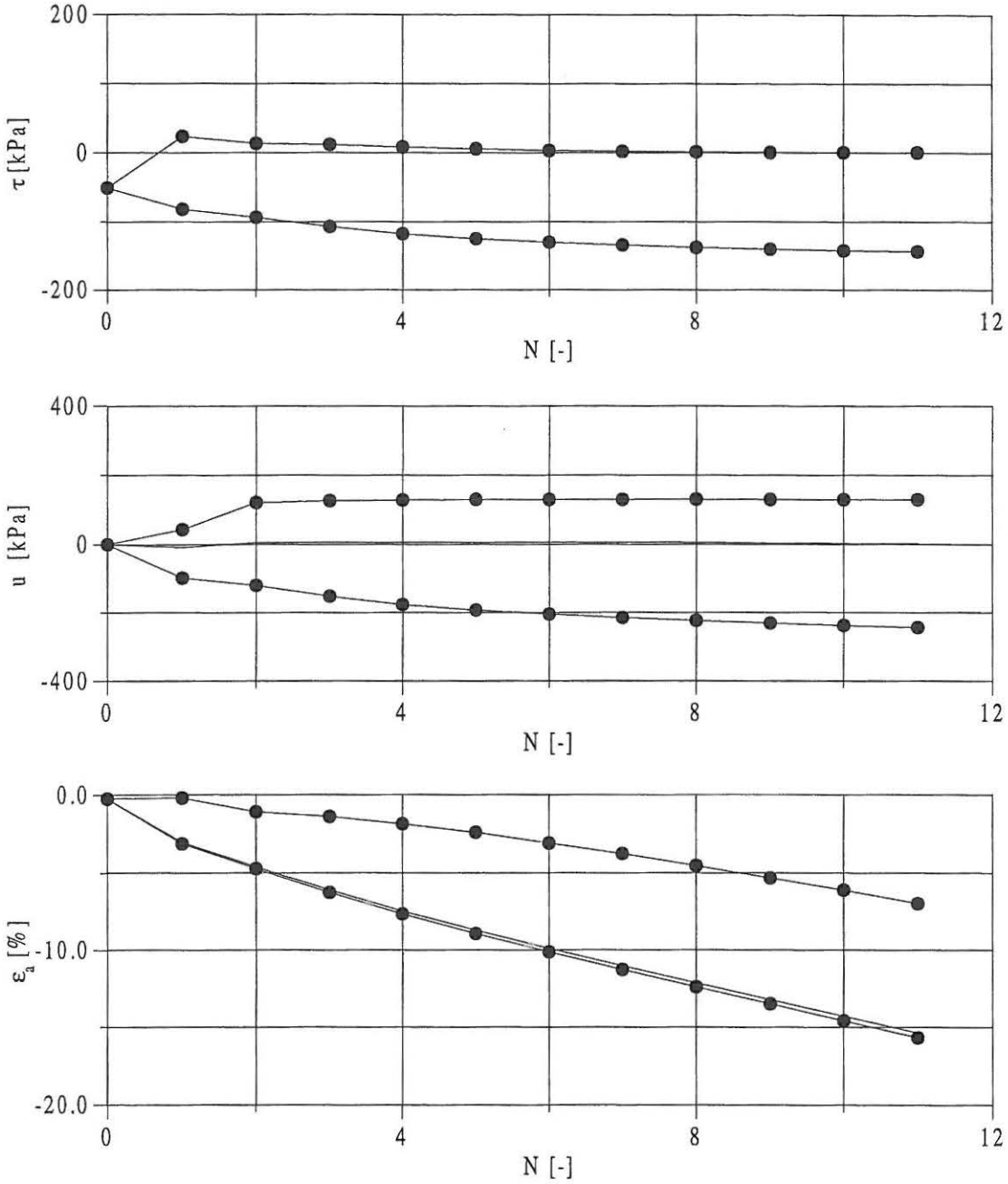




Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 18
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- ——— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 18 Checked: KPJ

Cyclic Triaxial Test No. 9701.50

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm] Diameter [mm]	70.00 70.00	69.94 69.94	67.71 70.77
Calibration file Cal.dat	Date 1998-01-07	Void ratio B-value	0.573	0.569 0.990	0.555

Test program			
	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	62.5	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	56.3	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	404.0	kPa
Pore pressure (u)	279.0	kPa
Axial strain (ε_a)	0.16	%
Volumetric strain (ε_v)	0.53	%

Anisotropic compression		
Shear stress (τ_o)	62.5	kPa
Confining pressure (σ_r)	404.2	kPa
Pore pressure (u)	279.2	kPa
Axial strain (ε_a)	0.48	%
Volumetric strain (ε_v)	0.74	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 19
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.83	%
Volumetric strain (ε_v)	0.89	%

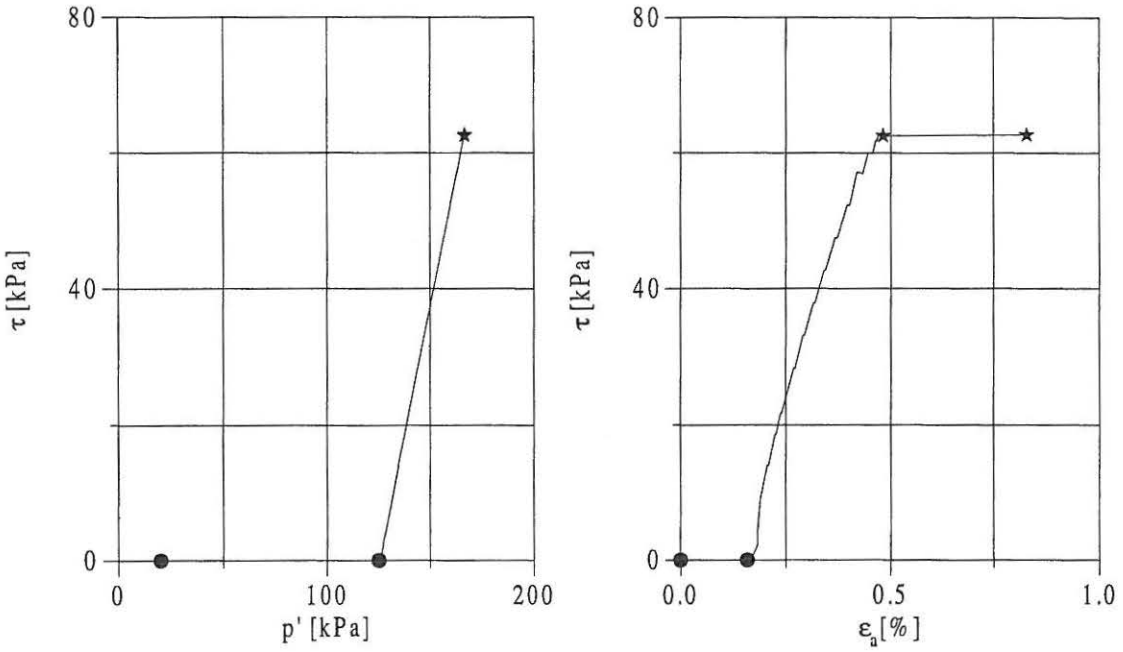
Anisotropic compression	Local	Global	
Shear stress (τ_a)		62.6	kPa
Confining pressure (σ_r)		404.4	kPa
Pore pressure (u)		279.6	kPa
Axial strain (ε_a)	0.00	0.83	%
Volumetric strain (ε_v)	0.00	0.89	%

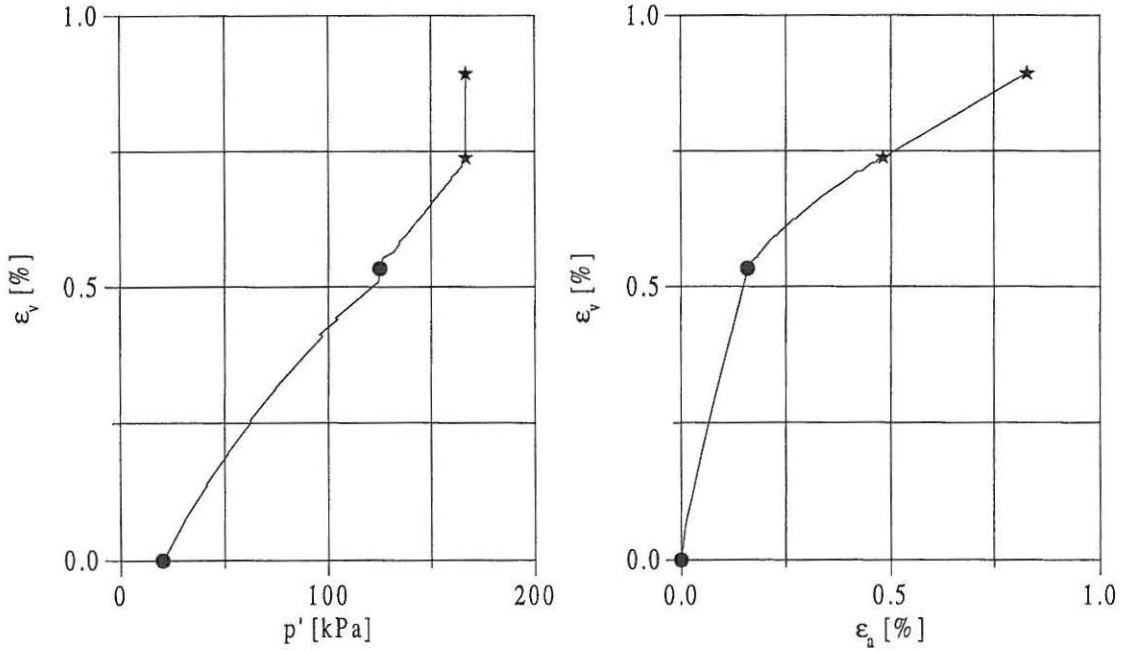
Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	7.5	21.9	29.5	39.7	46.7	kPa
Cyclic pore pressure (u^{cyc})	14.1	16.3	16.3	16.0	15.4	kPa
Permanent axial strain (ε_a^p)	0.11	0.28	0.39	0.59	0.78	%
Cyclic axial strain (ε_a^{cyc})	0.09	0.06	0.06	0.06	0.06	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	52.4	58.9	64.0	65.6	67.0	kPa
Cyclic pore pressure (u^{cyc})	14.9	14.3	13.9	14.1	13.9	kPa
Permanent axial strain (ε_a^p)	0.99	1.32	1.62	1.84	2.00	%
Cyclic axial strain (ε_a^{cyc})	0.06	0.06	0.06	0.06	0.06	%
	N=1250	N=1500	N=1750	N=2000		
Permanent pore pressure (u^p)	68.1	69.0	69.9	70.7		kPa
Cyclic pore pressure (u^{cyc})	13.9	13.9	13.9	13.9		kPa
Permanent axial strain (ε_a^p)	2.11	2.21	2.29	2.36		%
Cyclic axial strain (ε_a^{cyc})	0.06	0.06	0.06	0.06		%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 19 Checked: KPJ

Cyclic Triaxial Test No. 9701.50

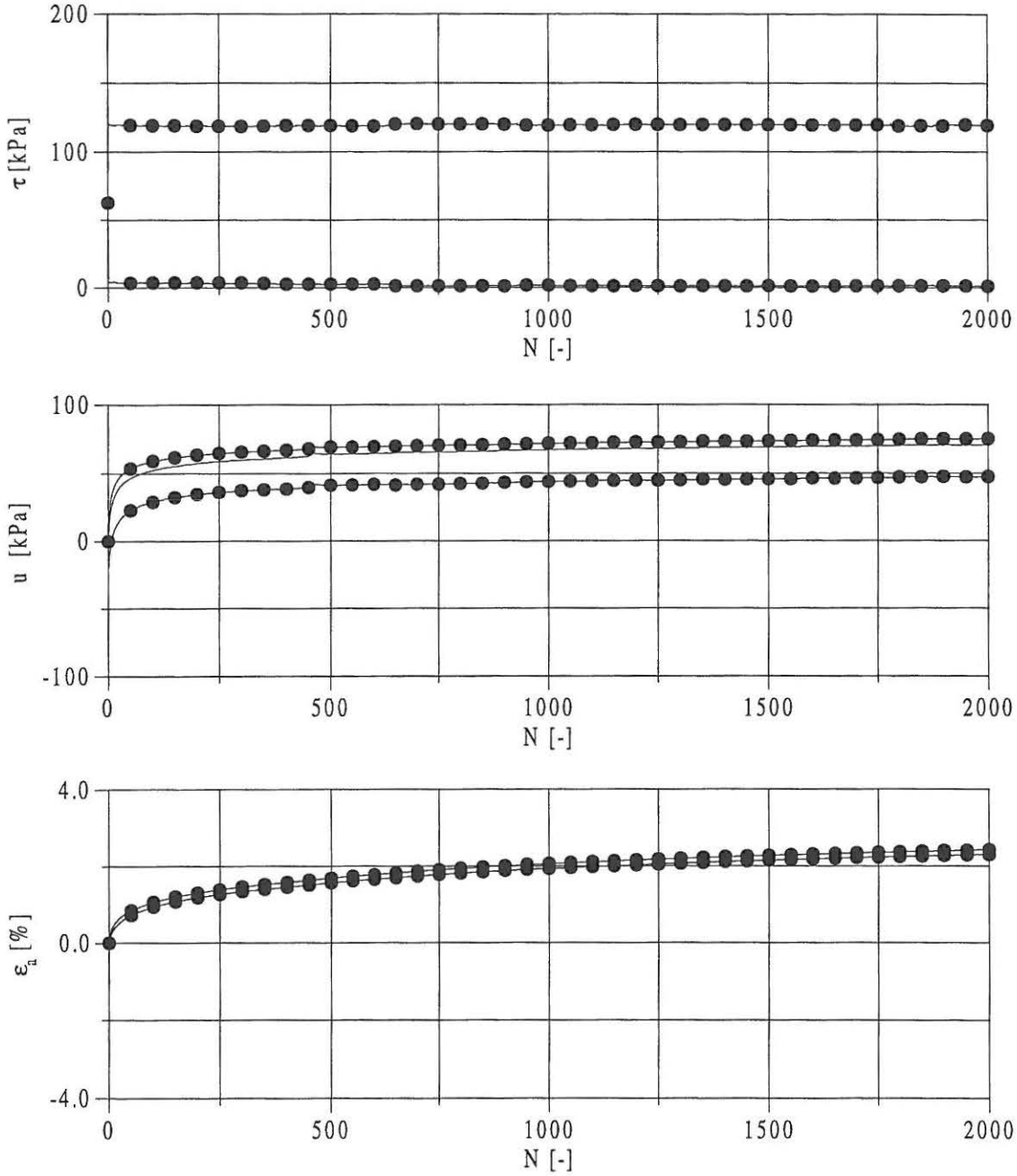




Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 19
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- — Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 19
Evaluated: KPJ	Checked: KPJ

Cyclic Triaxial Test No. 9701.51

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm]	70.00	69.95	66.14
		Diameter [mm]	70.00	69.95	71.61
Calibration file Cal.dat	Date 1998-01-04	Void ratio	0.573	0.570	0.555
		B-value		1.003	

Test program			
	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	62.5	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	125.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	324.9	kPa
Pore pressure (u)	199.9	kPa
Axial strain (ε_a)	0.18	%
Volumetric strain (ε_v)	0.55	%

Anisotropic compression		
Shear stress (τ_o)	62.4	kPa
Confining pressure (σ_r)	324.7	kPa
Pore pressure (u)	199.7	kPa
Axial strain (ε_a)	0.63	%
Volumetric strain (ε_v)	0.77	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 20
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	1.07	%
Volumetric strain (ε_v)	0.91	%

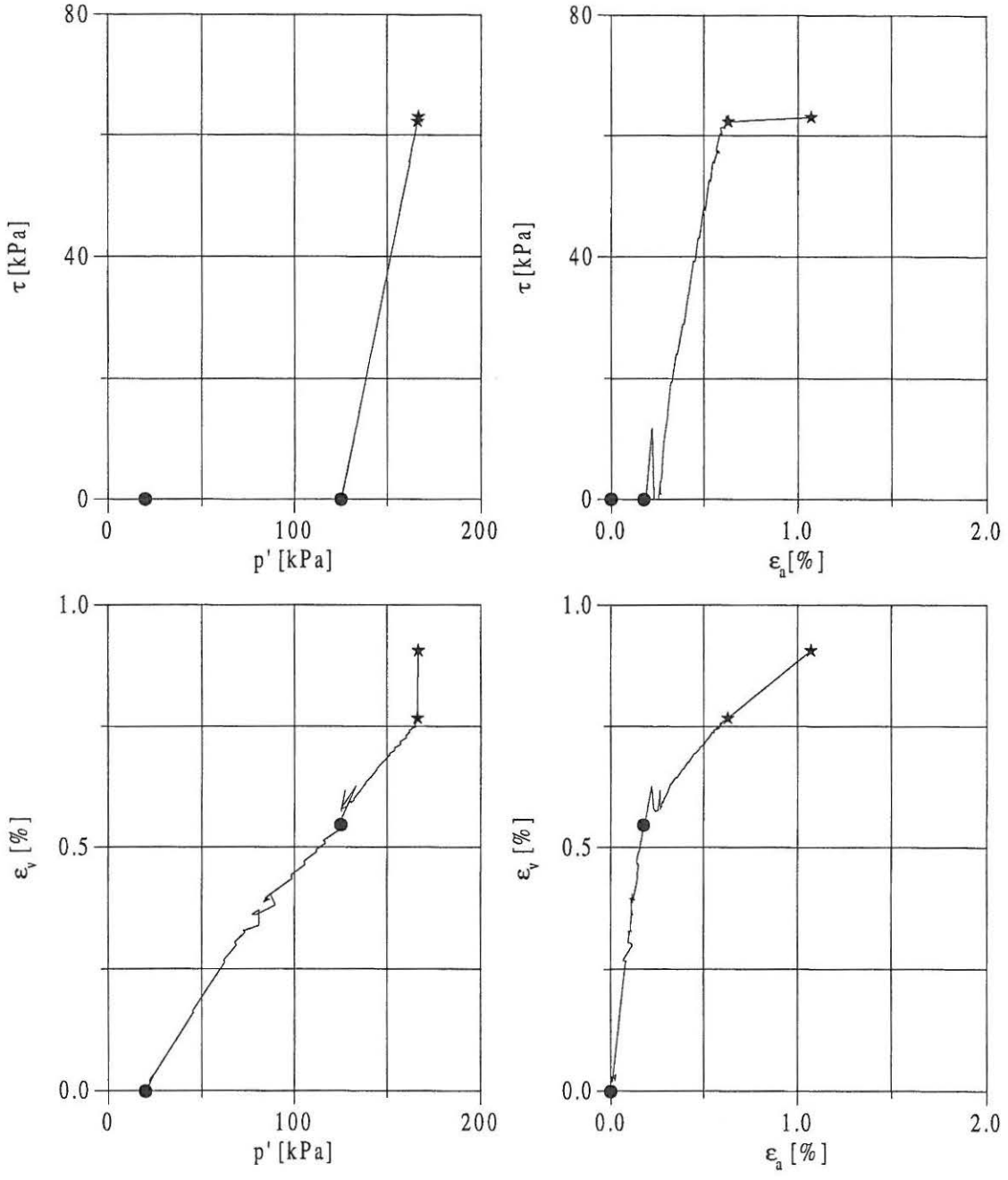
Anisotropic compression	Local	Global	
Shear stress (τ_a)		63.0	kPa
Confining pressure (σ_r)		324.5	kPa
Pore pressure (u)		199.6	kPa
Axial strain (ε_a)	0.00	1.07	%
Volumetric strain (ε_v)	0.00	0.91	%

Cyclic loading	N=1	N=5	N=10	N=25	
Permanent pore pressure (u^p)	78.0	108.4	115.0	118.4	kPa
Cyclic pore pressure (u^{cyc})	99.8	128.9	156.2	186.7	kPa
Permanent axial strain (ε_a^p)	0.11	0.48	1.03	4.38	%
Cyclic axial strain (ε_a^{cyc})	0.80	2.07	3.35	6.51	%
Permanent pore pressure (u^p)					kPa
Cyclic pore pressure (u^{cyc})					kPa
Permanent axial strain (ε_a^p)					%
Cyclic axial strain (ε_a^{cyc})					%
Permanent pore pressure (u^p)					kPa
Cyclic pore pressure (u^{cyc})					kPa
Permanent axial strain (ε_a^p)					%
Cyclic axial strain (ε_a^{cyc})					%

Remarks: Premature failure, due to necking near the top of the sample.

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 20 Checked: KPJ

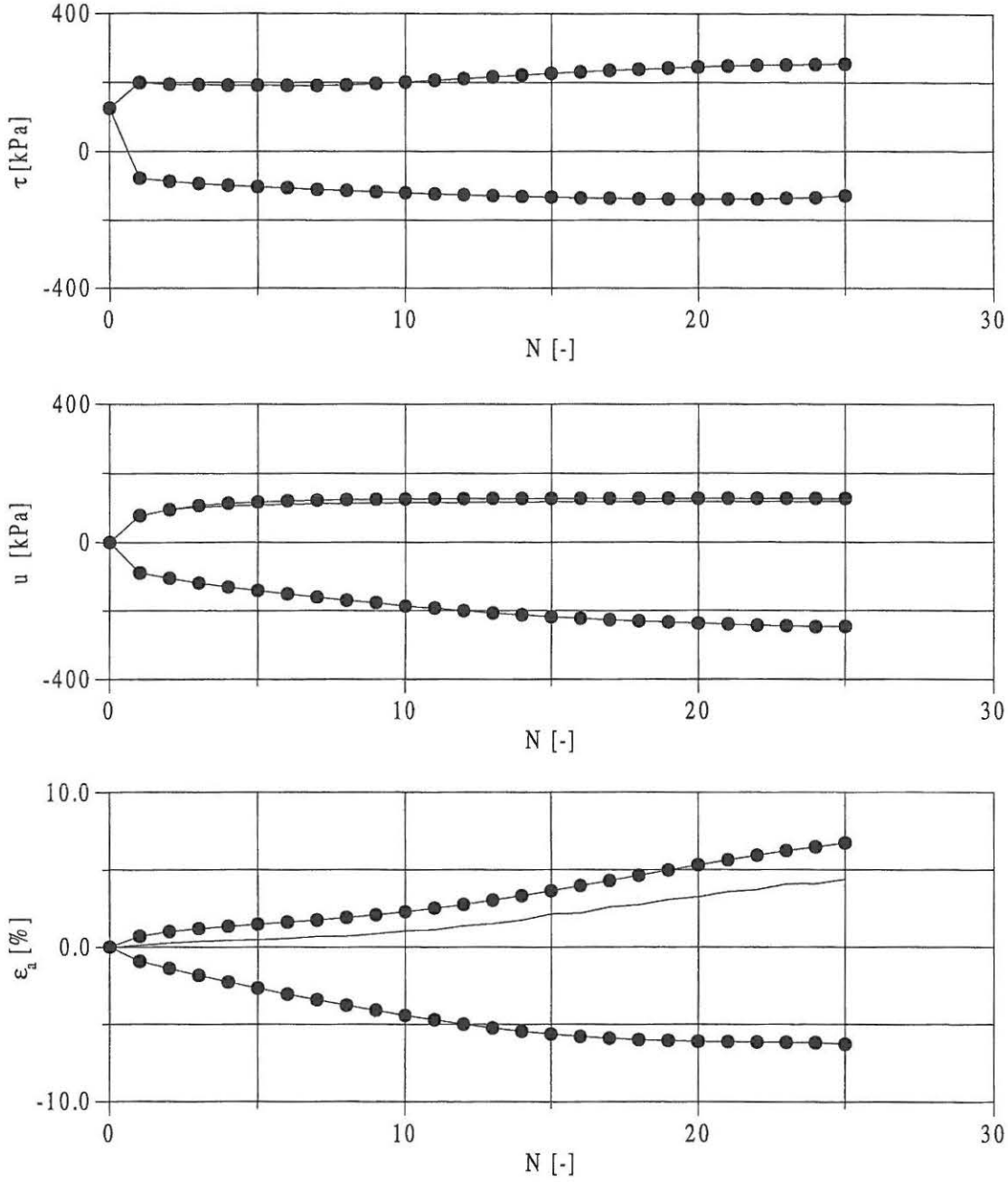
Cyclic Triaxial Test No. 9701.51



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 20
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- ——— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 20 Checked: KPJ

Cyclic Triaxial Test No. 9701.52

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm]	70.00	69.99	60.37
		Diameter [mm]	70.00	69.99	74.98
Calibration file Cal.dat	Date 1998-01-05	Void ratio	0.573	0.572	0.556
		B-value		0.984	

Test program			
	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	62.5	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	87.5	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	325.6	kPa
Pore pressure (u)	200.6	kPa
Axial strain (ε_a)	0.17	%
Volumetric strain (ε_v)	0.57	%

Anisotropic compression		
Shear stress (τ_o)	62.6	kPa
Confining pressure (σ_r)	326.1	kPa
Pore pressure (u)	201.0	kPa
Axial strain (ε_a)	0.39	%
Volumetric strain (ε_v)	0.76	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 21
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.65	%
Volumetric strain (ε_v)	1.02	%

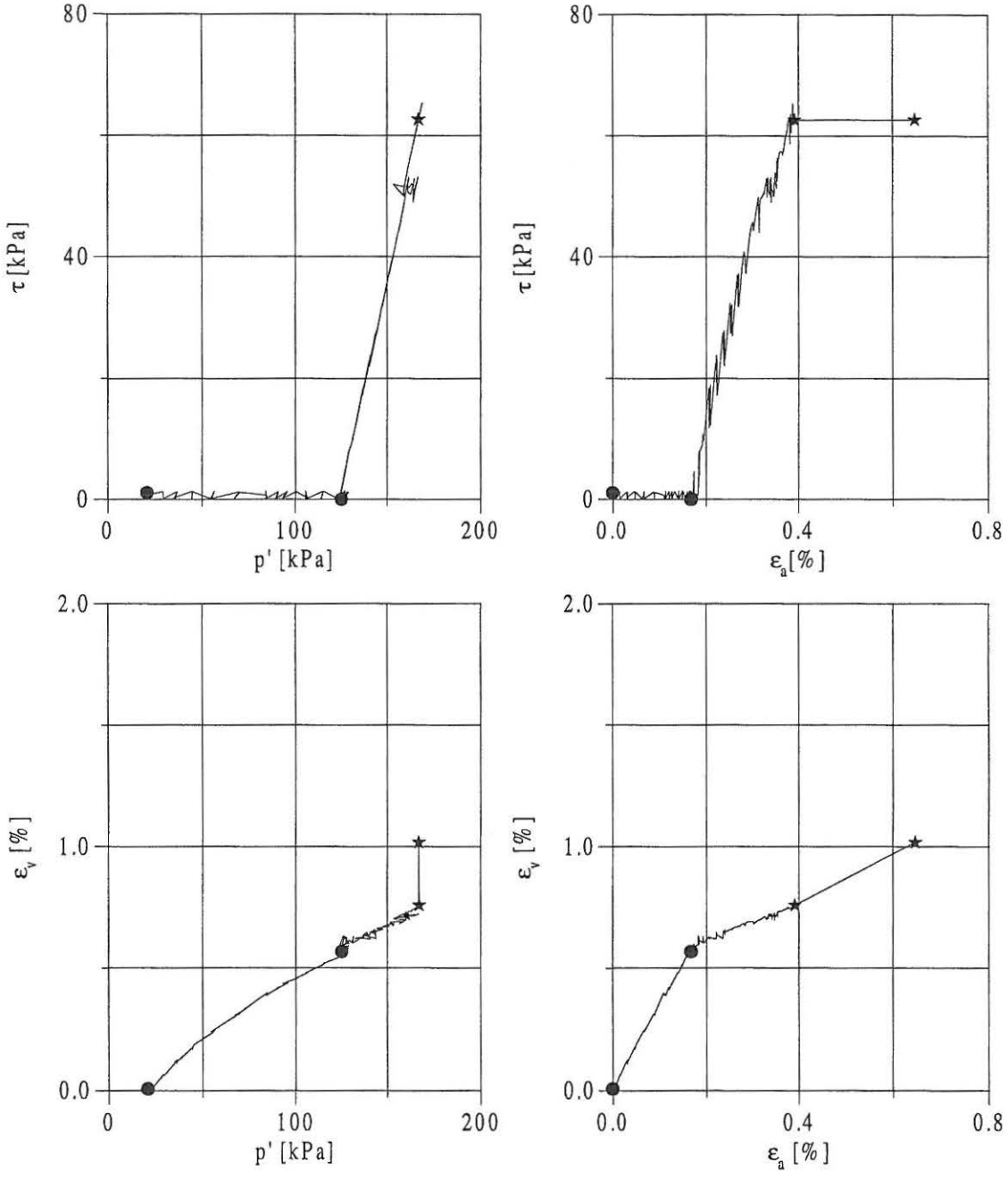
Anisotropic compression	Local	Global	
Shear stress (τ_a)		62.6	kPa
Confining pressure (σ_r)		326.6	kPa
Pore pressure (u)		201.5	kPa
Axial strain (ε_a)	0.00	0.65	%
Volumetric strain (ε_v)	0.00	1.02	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	34.1	69.1	84.4	107.4	117.7	kPa
Cyclic pore pressure (u^{cyc})	28.5	25.5	26.1	40.3	62.0	kPa
Permanent axial strain (ε_a^p)	0.10	0.39	0.64	1.37	7.57	%
Cyclic axial strain (ε_a^{cyc})	0.18	0.24	0.32	0.97	3.68	%
	N=62					
Permanent pore pressure (u^p)	120.1					kPa
Cyclic pore pressure (u^{cyc})	62.7					kPa
Permanent axial strain (ε_a^p)	13.10					%
Cyclic axial strain (ε_a^{cyc})	4.17					%
Permanent pore pressure (u^p)						kPa
Cyclic pore pressure (u^{cyc})						kPa
Permanent axial strain (ε_a^p)						%
Cyclic axial strain (ε_a^{cyc})						%

Remarks: Noise on load signals

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 21
Evaluated: KPJ	Checked: KPJ

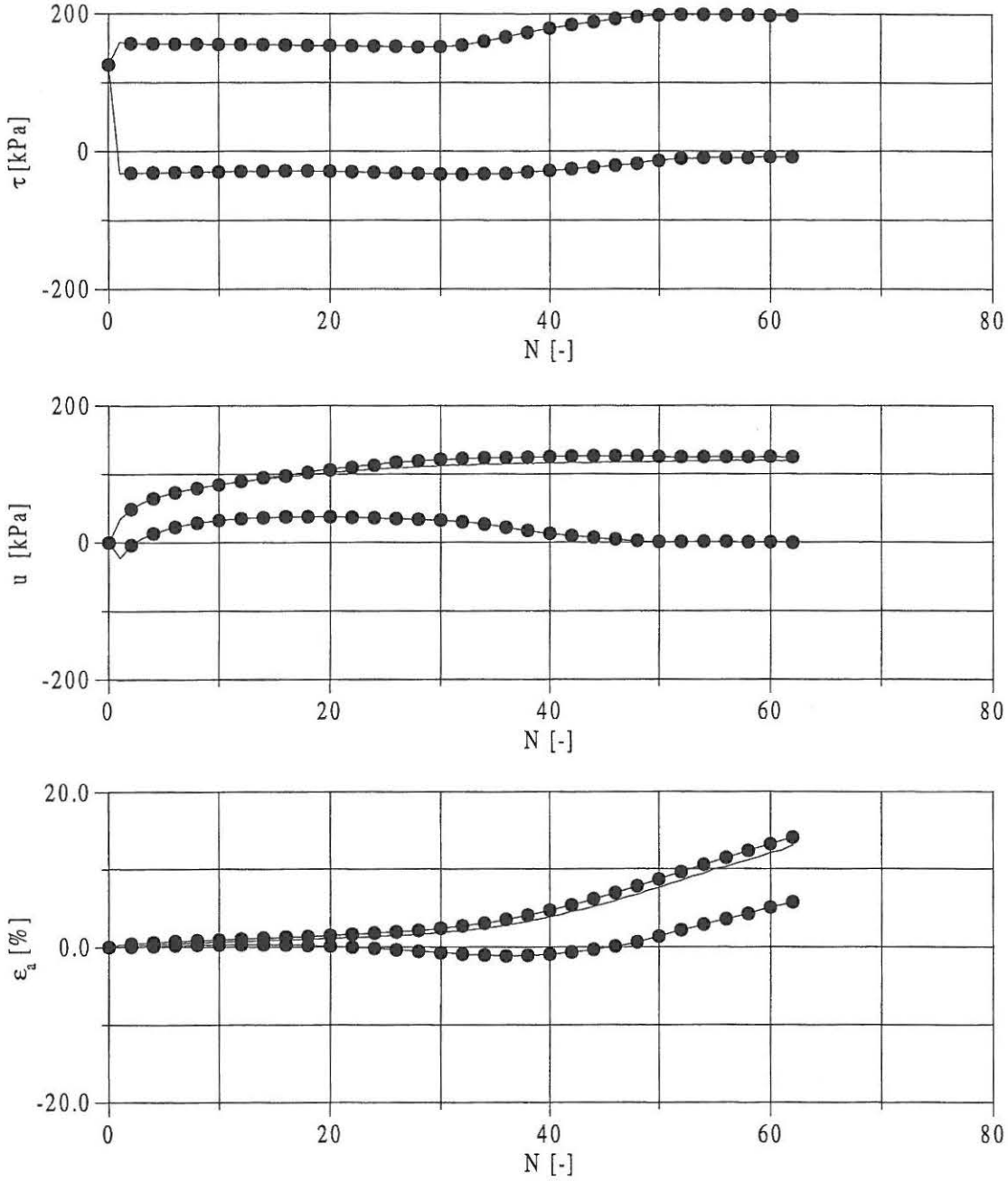
Cyclic Triaxial Test No. 9701.52



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 21
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 21 Checked: KPJ

Cyclic Triaxial Test No. 9701.53

Description of soil Oosterschelde Sand			Before test	Start test	After test
Cyclic Triaxial Apparatus		Dimension Height [mm] Diameter [mm]	70.00 70.00	69.94 69.94	67.88 70.67
Calibration file Cal.dat	Date 1998-01-06	Void ratio B-value	0.573	0.569 1.000	0.555

Test program			
	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	125.0	kPa
	Loading rate:	5.0	kPa/min
	☐ Applied drained		
	☒ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	75.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	324.8	kPa
Pore pressure (u)	199.8	kPa
Axial strain (ε_a)	0.37	%
Volumetric strain (ε_v)	0.65	%

Anisotropic compression		
Shear stress (τ_o)	62.7	kPa
Confining pressure (σ_r)	324.9	kPa
Pore pressure (u)	199.9	kPa
Axial strain (ε_a)	0.58	%
Volumetric strain (ε_v)	0.78	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 22
Evaluated: KPJ	Checked: KPJ

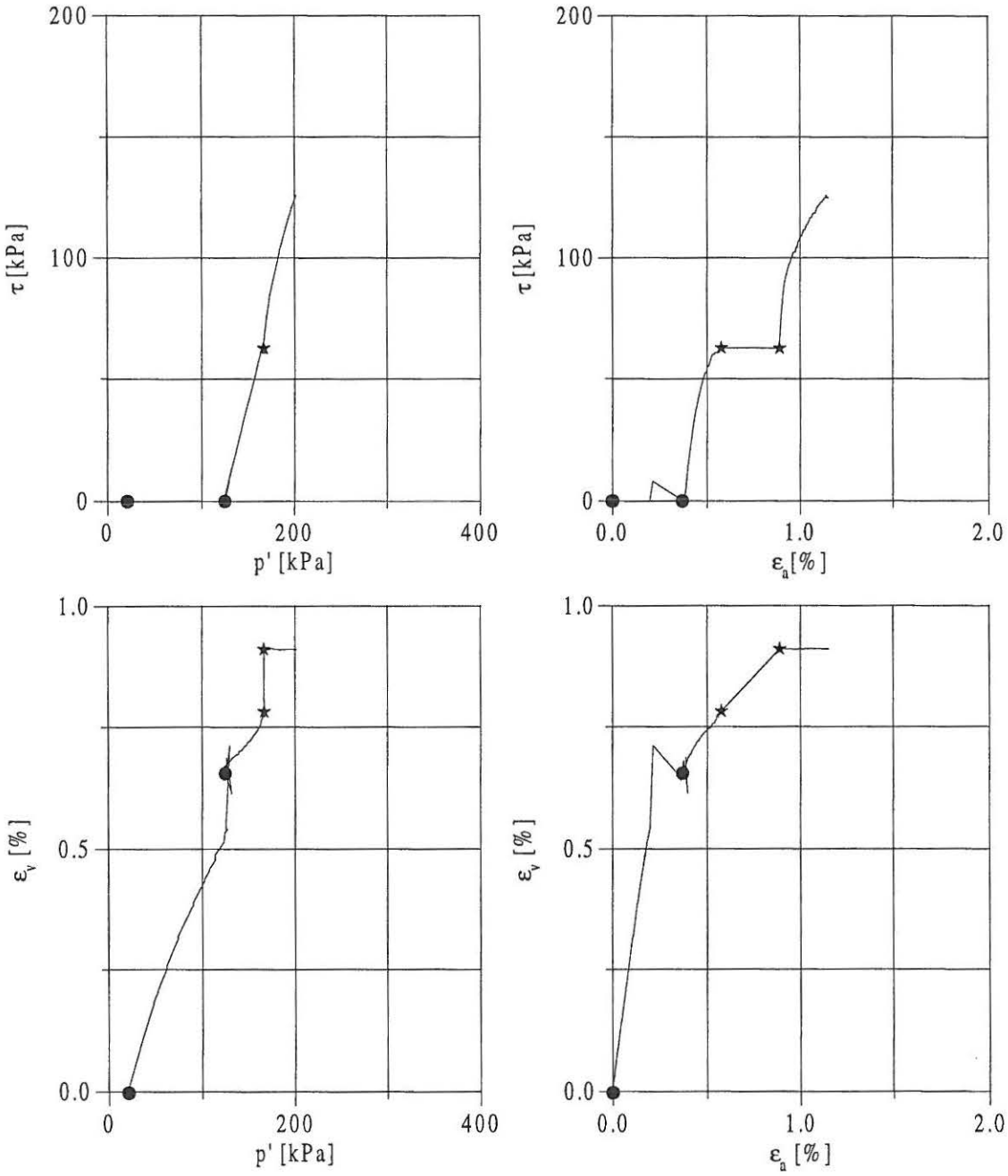
Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.89	%
Volumetric strain (ε_v)	0.91	%

Anisotropic compression	Local	Global	
Shear stress (τ_a)		125.0	kPa
Confining pressure (σ_r)		324.4	kPa
Pore pressure (u)		206.9	kPa
Axial strain (ε_a)	0.26	1.15	%
Volumetric strain (ε_v)	0.00	0.91	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-19.9	-19.9	-19.3	-17.4	-15.2	kPa
Cyclic pore pressure (u^{cyc})	26.6	14.8	15.0	15.4	15.6	kPa
Permanent axial strain (ε_a^p)	0.66	0.82	0.91	1.05	1.16	%
Cyclic axial strain (ε_a^{cyc})	0.24	0.05	0.05	0.05	0.05	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	-12.7	-9.8	-9.0	-7.1	-5.9	kPa
Cyclic pore pressure (u^{cyc})	15.4	15.0	14.8	15.0	14.9	kPa
Permanent axial strain (ε_a^p)	1.28	1.44	1.56	1.63	1.68	%
Cyclic axial strain (ε_a^{cyc})	0.05	0.05	0.04	0.04	0.04	%
	N=1250	N=1500	N=1750	N=2000		
Permanent pore pressure (u^p)	-4.9	-4.2	-3.8	-3.3		kPa
Cyclic pore pressure (u^{cyc})	14.8	15.1	15.0	15.0		kPa
Permanent axial strain (ε_a^p)	1.71	1.74	1.77	1.79		%
Cyclic axial strain (ε_a^{cyc})	0.04	0.04	0.04	0.04		%

Remarks:

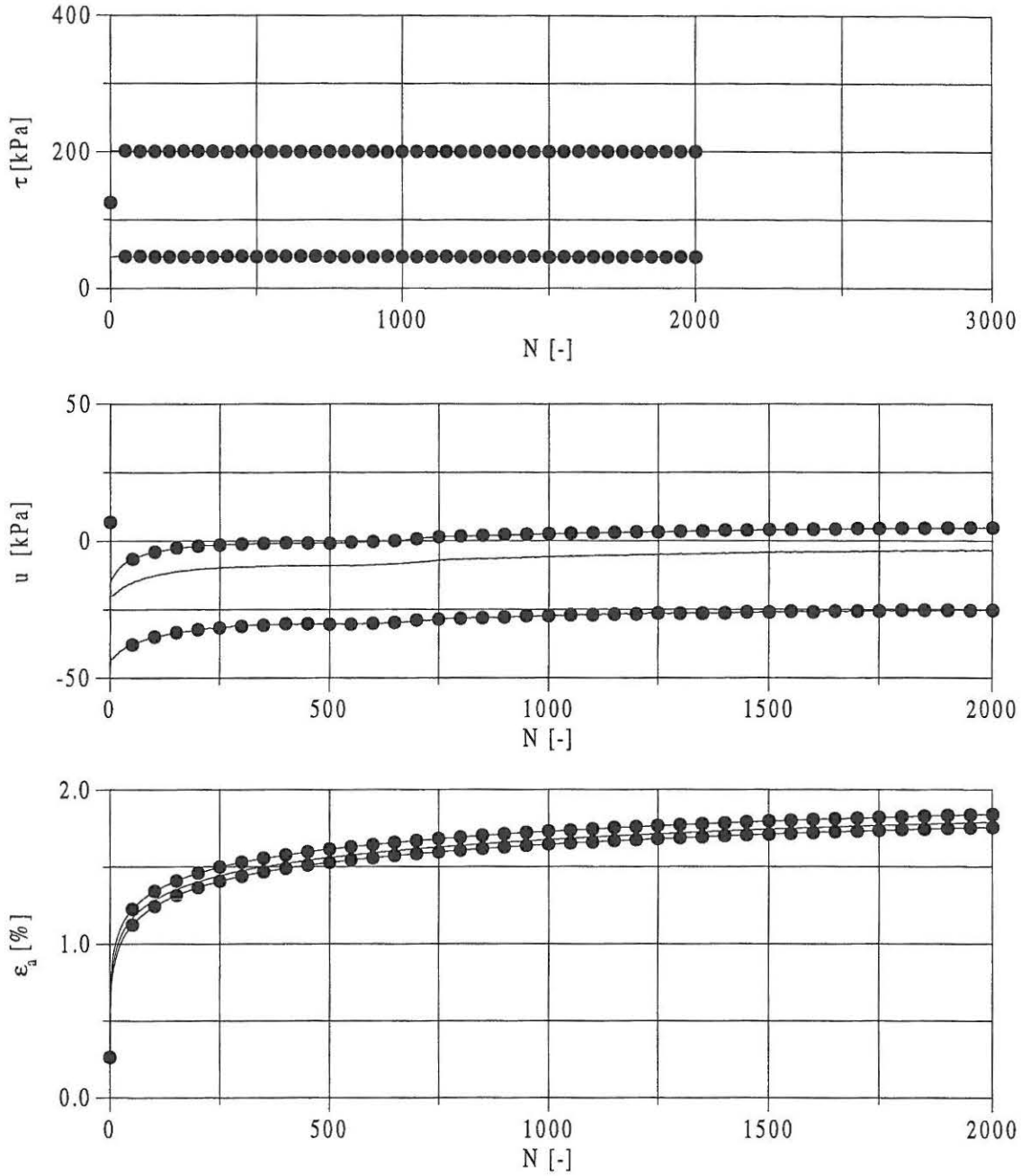
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 22
Evaluated: KPJ	Checked: KPJ



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 22
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 22 Checked: KPJ

Cyclic Triaxial Test No. 9701.54

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm] Diameter [mm]	70.00 70.00	69.94 69.94	68.71 70.07
Calibration file Cal.dat	Date 1998-01-07	Void ratio B-value	0.573	0.569 0.997	0.547

Test program			
	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	62.5	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	162.5	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	324.7	kPa
Pore pressure (u)	199.7	kPa
Axial strain (ε_a)	0.19	%
Volumetric strain (ε_v)	0.58	%

Anisotropic compression		
Shear stress (τ_o)	62.5	kPa
Confining pressure (σ_r)	324.8	kPa
Pore pressure (u)	199.7	kPa
Axial strain (ε_a)	0.49	%
Volumetric strain (ε_v)	0.79	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 23
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.84	%
Volumetric strain (ε_v)	1.39	%

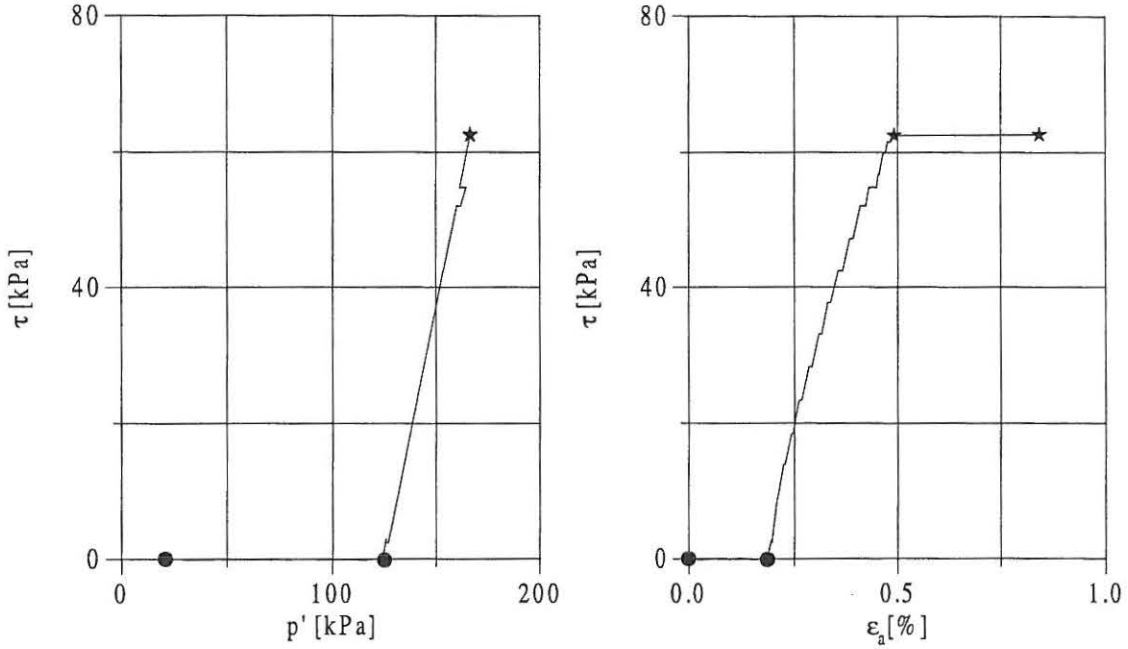
Anisotropic compression	Local	Global	
Shear stress (τ_a)		62.6	kPa
Confining pressure (σ_r)		324.8	kPa
Pore pressure (u)		199.7	kPa
Axial strain (ε_a)	0.00	0.84	%
Volumetric strain (ε_v)	0.00	1.39	%

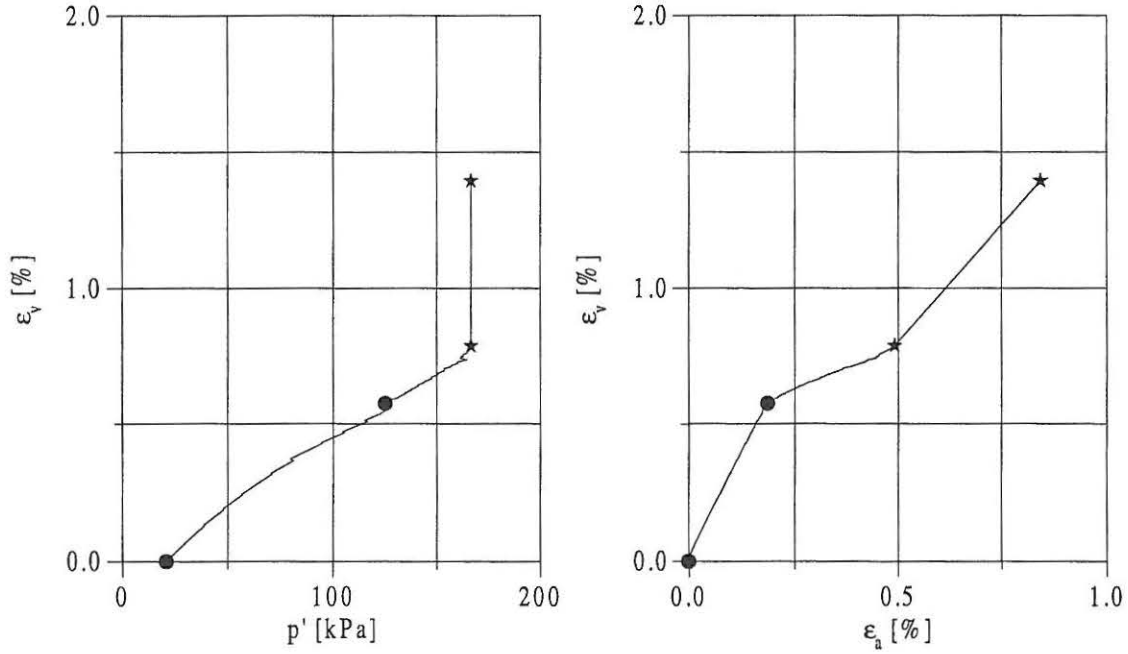
Cyclic loading	N=1	N=5	N=10	N=13	
Permanent pore pressure (u^p)	82.9	108.3	111.4	111.1	kPa
Cyclic pore pressure (u^{cyc})	154.7	190.7	202.1	203.8	kPa
Permanent axial strain (ε_a^p)	-0.01	0.43	0.85	0.92	%
Cyclic axial strain (ε_a^{cyc})	1.38	2.84	4.64	5.56	%
Permanent pore pressure (u^p)					kPa
Cyclic pore pressure (u^{cyc})					kPa
Permanent axial strain (ε_a^p)					%
Cyclic axial strain (ε_a^{cyc})					%
Permanent pore pressure (u^p)					kPa
Cyclic pore pressure (u^{cyc})					kPa
Permanent axial strain (ε_a^p)					%
Cyclic axial strain (ε_a^{cyc})					%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 23
Evaluated: KPJ	Checked: KPJ

Cyclic Triaxial Test No. 9701.54

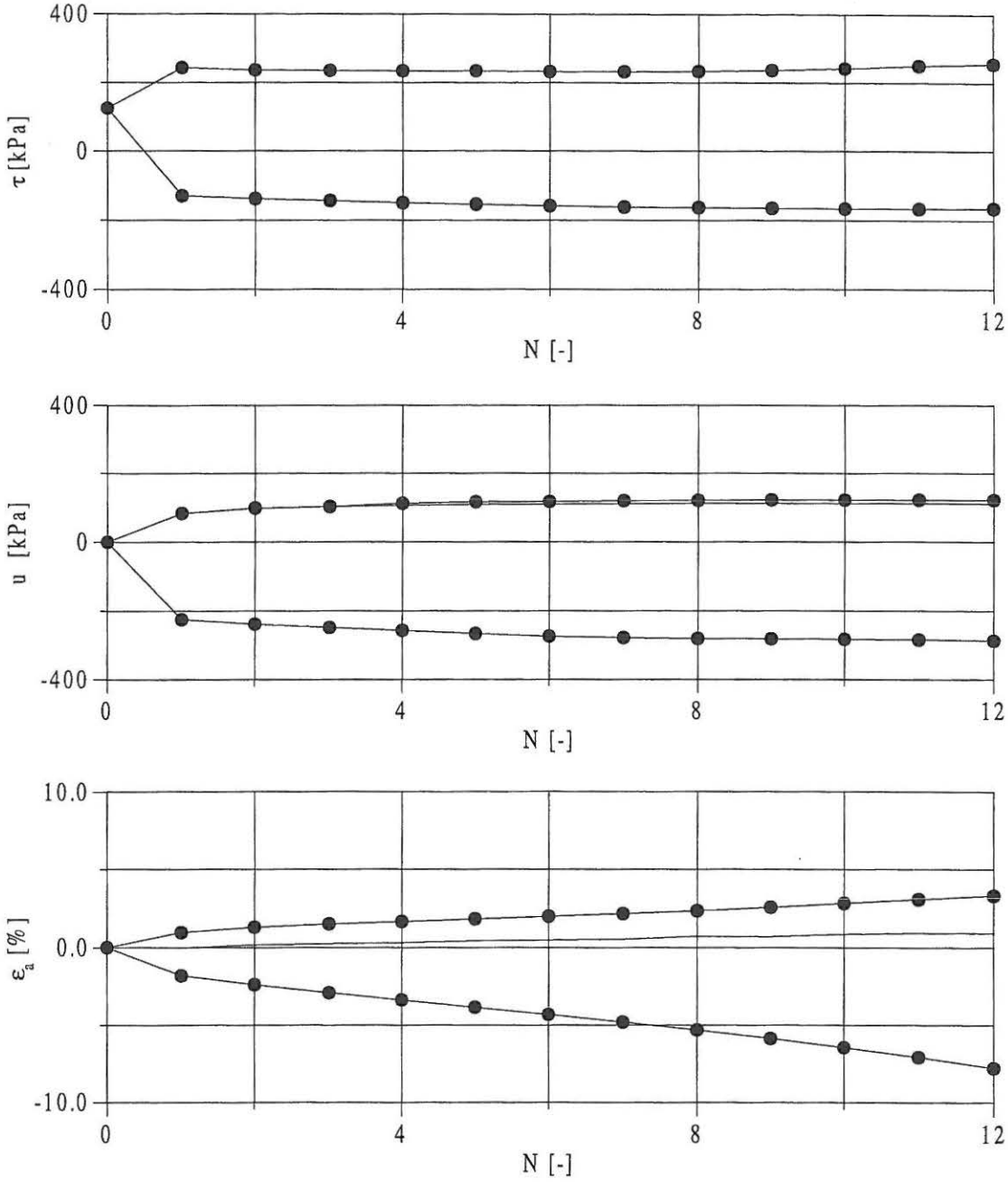




Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 23
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 23 Checked: KPJ

Cyclic Triaxial Test No. 9701.55

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm] Diameter [mm]	70.00 70.00	69.95 69.95	67.61 71.89
Calibration file Cal.dat	Date 1998-01-09	Void ratio B-value	0.573	0.570 0.993	0.554

Test program			
	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	175.0	kPa
	Loading rate:	5.0	kPa/min
	☐ Applied drained		
	☒ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	125.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	325.8	kPa
Pore pressure (u)	200.8	kPa
Axial strain (ε_a)	0.11	%
Volumetric strain (ε_v)	0.40	%

Anisotropic compression		
Shear stress (τ_o)	62.6	kPa
Confining pressure (σ_r)	325.8	kPa
Pore pressure (u)	200.8	kPa
Axial strain (ε_a)	0.40	%
Volumetric strain (ε_v)	0.57	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 24
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.67	%
Volumetric strain (ε_v)	1.02	%

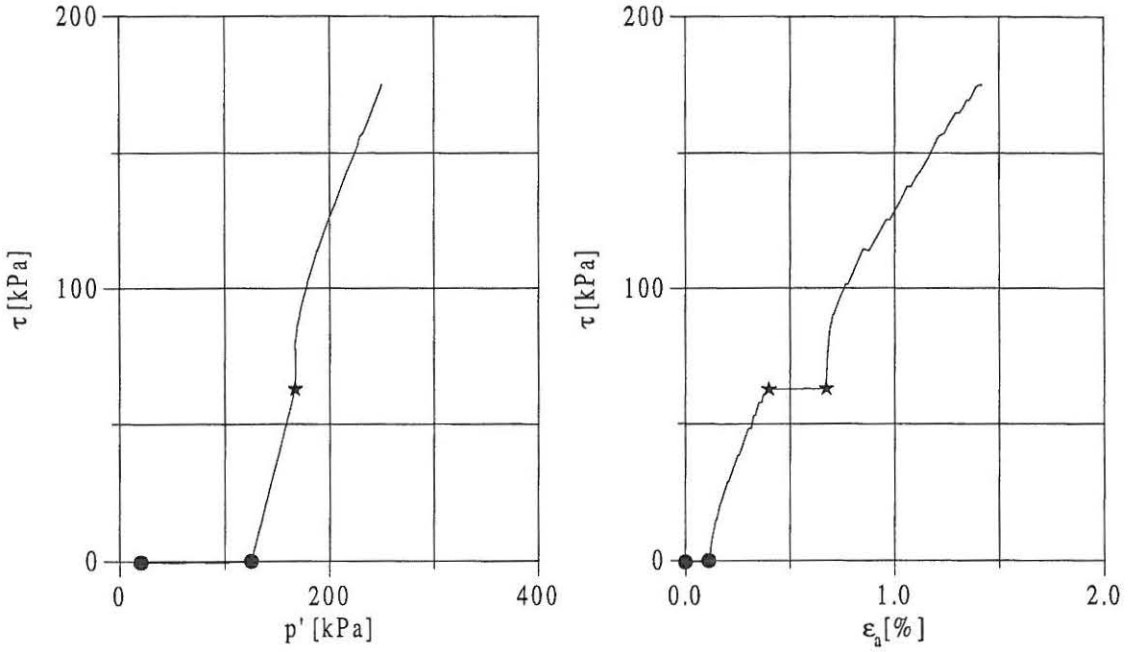
Anisotropic compression	Local	Global	
Shear stress (τ_a)		174.9	kPa
Confining pressure (σ_r)		326.2	kPa
Pore pressure (u)		193.2	kPa
Axial strain (ε_a)	0.40	1.42	%
Volumetric strain (ε_v)	0.00	1.02	%

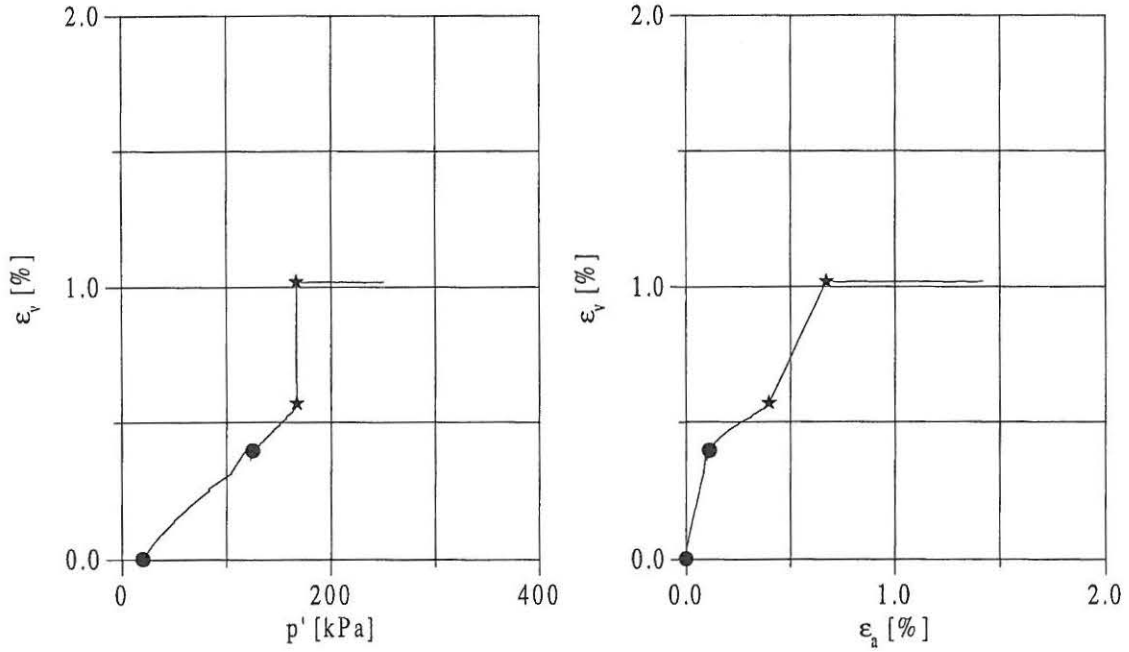
Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-26.9	-42.4	-47.2	-50.5	-50.6	kPa
Cyclic pore pressure (u^{cyc})	45.8	21.4	21.0	21.7	22.4	kPa
Permanent axial strain (ε_a^p)	0.84	1.12	1.25	1.43	1.56	%
Cyclic axial strain (ε_a^{cyc})	0.27	0.08	0.08	0.07	0.07	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	-49.4	-46.5	-45.1	-44.1	-43.0	kPa
Cyclic pore pressure (u^{cyc})	22.5	22.9	23.1	23.4	23.7	kPa
Permanent axial strain (ε_a^p)	1.70	1.90	2.07	2.15	2.21	%
Cyclic axial strain (ε_a^{cyc})	0.06	0.06	0.06	0.06	0.05	%
	N=1250	N=1500	N=1750	N=2000		
Permanent pore pressure (u^p)	-42.6	-41.8	-40.8	-39.9		kPa
Cyclic pore pressure (u^{cyc})	23.8	23.8	23.8	24.0		kPa
Permanent axial strain (ε_a^p)	2.25	2.28	2.31	2.33		%
Cyclic axial strain (ε_a^{cyc})	0.06	0.05	0.05	0.05		%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 24
Evaluated: KPJ	Checked: KPJ

Cyclic Triaxial Test No. 9701.55

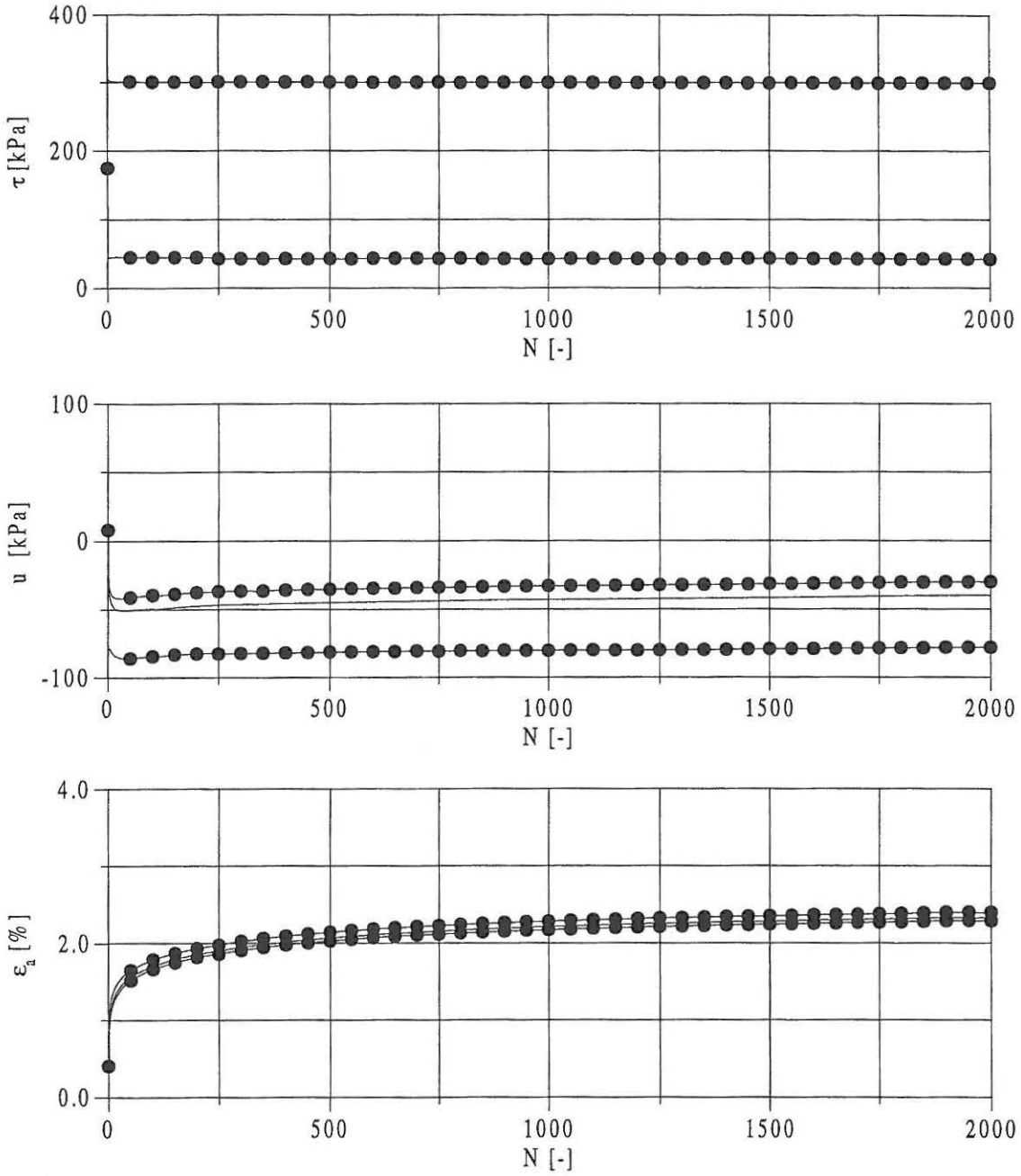




Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 24
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- ——— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 24 Checked: KPJ

Cyclic Triaxial Test No. 9701.56

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm]	70.00	69.93	67.70
		Diameter [mm]	70.00	69.93	70.89
Calibration file Cal.dat	Date 1998-01-12	Void ratio	0.573	0.568	0.560
		B-value		0.997	

Test program			
	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	175.0	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	125.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	324.4	kPa
Pore pressure (u)	199.4	kPa
Axial strain (ε_a)	0.12	%
Volumetric strain (ε_v)	0.42	%

Anisotropic compression		
Shear stress (τ_o)	62.3	kPa
Confining pressure (σ_r)	324.8	kPa
Pore pressure (u)	199.8	kPa
Axial strain (ε_a)	0.36	%
Volumetric strain (ε_v)	0.56	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 25
Evaluated: KPJ	Checked: KPJ

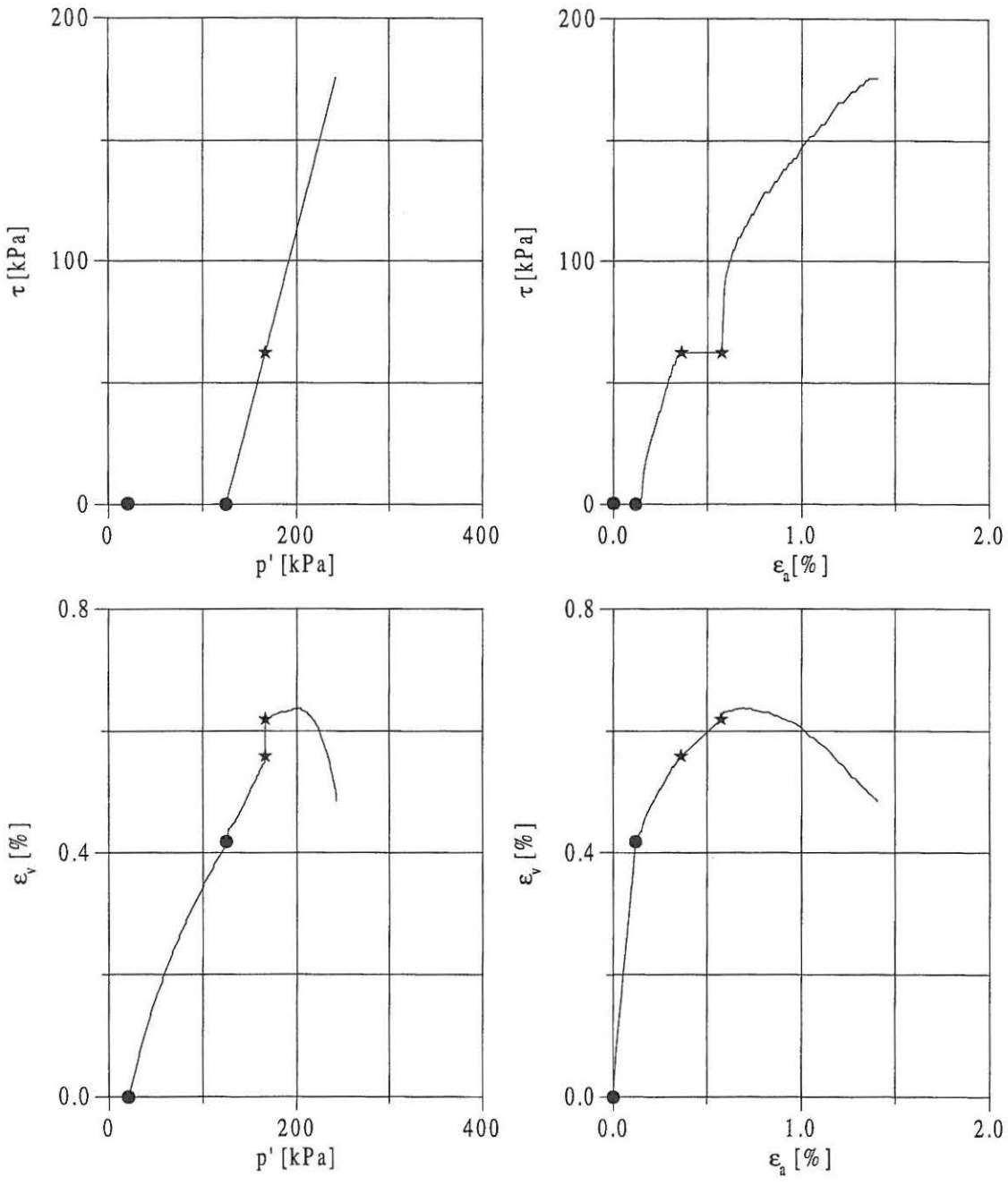
Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.57	%
Volumetric strain (ε_v)	0.62	%

Anisotropic compression	Local	Global	
Shear stress (τ_a)		175.0	kPa
Confining pressure (σ_r)		325.5	kPa
Pore pressure (u)		200.5	kPa
Axial strain (ε_a)	0.84	1.41	%
Volumetric strain (ε_v)	-0.13	0.49	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-39.1	-53.7	-58.8	-62.6	-63.9	kPa
Cyclic pore pressure (u^{cyc})	47.8	20.4	19.3	19.8	20.4	kPa
Permanent axial strain (ε_a^p)	1.24	1.49	1.62	1.79	1.92	%
Cyclic axial strain (ε_a^{cyc})	0.25	0.07	0.06	0.06	0.06	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	-64.4	-63.9	-63.2	-63.0	-62.8	kPa
Cyclic pore pressure (u^{cyc})	20.8	21.7	22.1	22.4	22.5	kPa
Permanent axial strain (ε_a^p)	2.05	2.23	2.37	2.45	2.50	%
Cyclic axial strain (ε_a^{cyc})	0.06	0.06	0.06	0.06	0.05	%
	N=1250	N=1500	N=1750	N=2000		
Permanent pore pressure (u^p)	-62.4	-62.3	-62.2	-62.0		kPa
Cyclic pore pressure (u^{cyc})	22.8	22.8	23.1	23.1		kPa
Permanent axial strain (ε_a^p)	2.54	2.57	2.60	2.62		%
Cyclic axial strain (ε_a^{cyc})	0.06	0.05	0.05	0.05		%

Remarks:

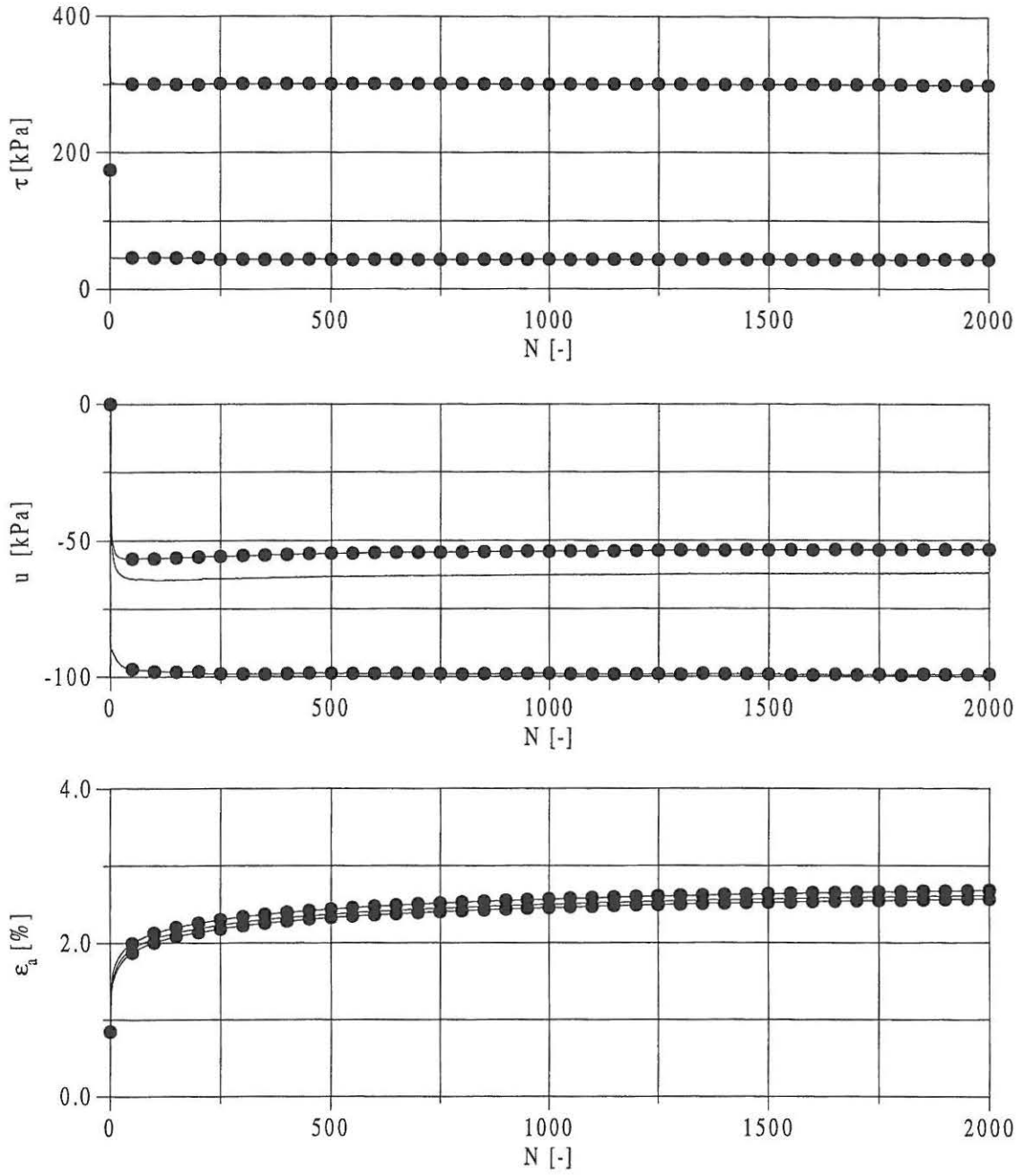
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 25
Evaluated: KPJ	Checked: KPJ



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 25
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 25 Checked: KPJ

Cyclic Triaxial Test No. 9701.57

Description of soil			Before test	Start test	After test
Oosterschelde Sand		Dimension			
		Height [mm]	70.00	69.92	67.00
Cyclic Triaxial Apparatus		Diameter [mm]	70.00	69.92	71.24
Calibration file	Date	Void ratio	0.573	0.568	0.559
Cal.dat	1998-01-10	B-value		0.970	

Test program			
	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	225.0	kPa
	Loading rate:	5.0	kPa/min
	☐ Applied drained		
	☒ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	193.8	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	425.4	kPa
Pore pressure (u)	300.4	kPa
Axial strain (ε_a)	0.10	%
Volumetric strain (ε_v)	0.35	%

Anisotropic compression		
Shear stress (τ_o)	62.9	kPa
Confining pressure (σ_r)	425.5	kPa
Pore pressure (u)	300.5	kPa
Axial strain (ε_a)	0.32	%
Volumetric strain (ε_v)	0.48	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 26
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.53	%
Volumetric strain (ε_v)	0.53	%

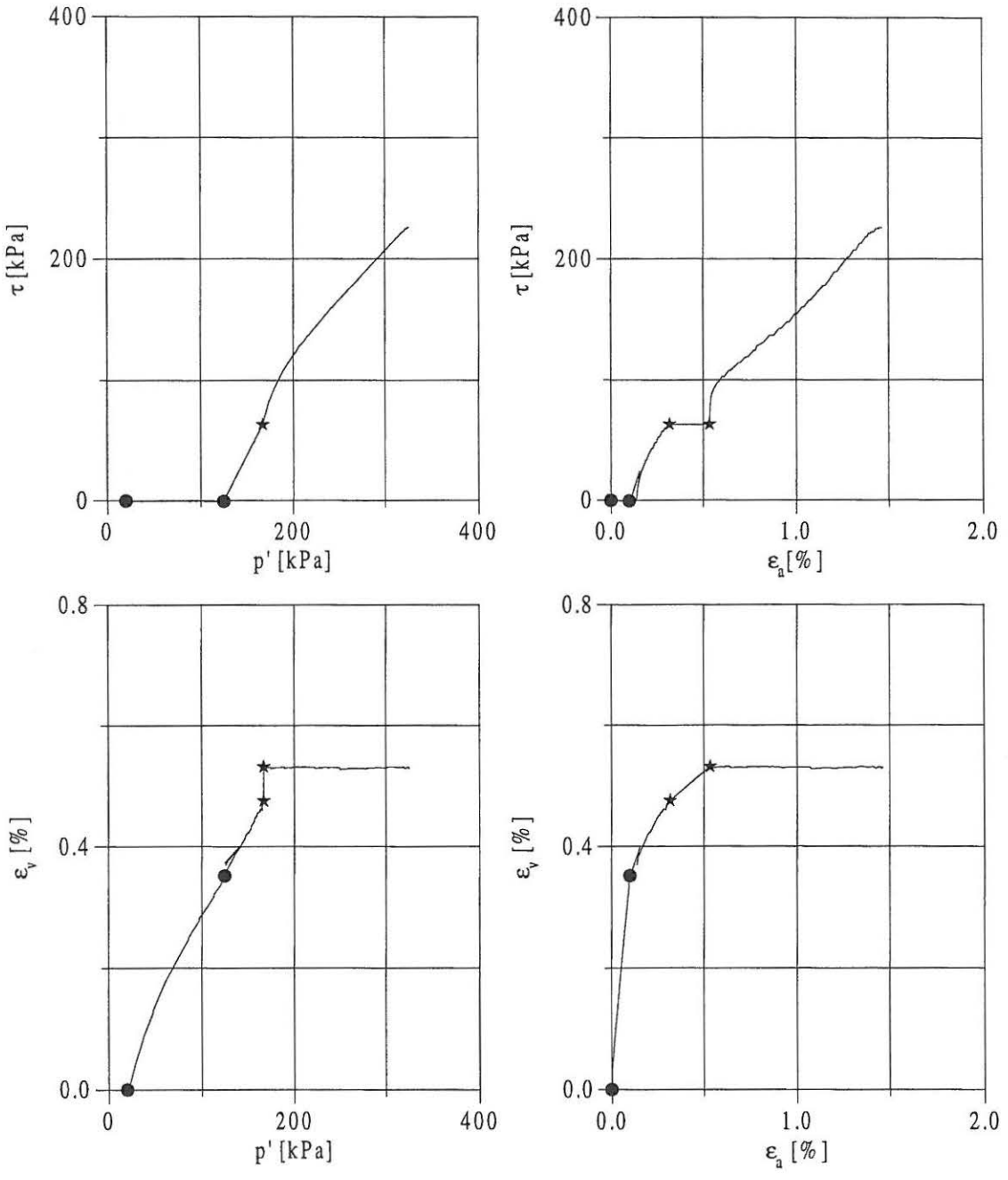
Anisotropic compression	Local	Global	
Shear stress (τ_a)		225.6	kPa
Confining pressure (σ_r)		425.4	kPa
Pore pressure (u)		250.8	kPa
Axial strain (ε_a)	0.93	1.46	%
Volumetric strain (ε_v)	0.00	0.53	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-94.6	-120.7	-129.1	-136.3	-137.8	kPa
Cyclic pore pressure (u^{cyc})	69.2	26.7	24.7	24.4	25.1	kPa
Permanent axial strain (ε_a^p)	1.51	1.92	2.12	2.39	2.59	%
Cyclic axial strain (ε_a^{cyc})	0.37	0.11	0.11	0.10	0.09	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	-138.2	-134.7	-132.2	-130.5	-128.6	kPa
Cyclic pore pressure (u^{cyc})	25.6	26.2	27.4	27.8	28.3	kPa
Permanent axial strain (ε_a^p)	2.78	3.02	3.24	3.37	3.45	%
Cyclic axial strain (ε_a^{cyc})	0.09	0.08	0.08	0.08	0.08	%
	N=1250	N=1500	N=1750	N=2000		
Permanent pore pressure (u^p)	-127.0	-126.1	-124.7	-123.0		kPa
Cyclic pore pressure (u^{cyc})	28.6	28.8	29.1	29.3		kPa
Permanent axial strain (ε_a^p)	3.52	3.57	3.61	3.65		%
Cyclic axial strain (ε_a^{cyc})	0.08	0.08	0.08	0.08		%

Remarks: Isotropic preconsolidation of 70 kPa

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 26 Checked: KPJ

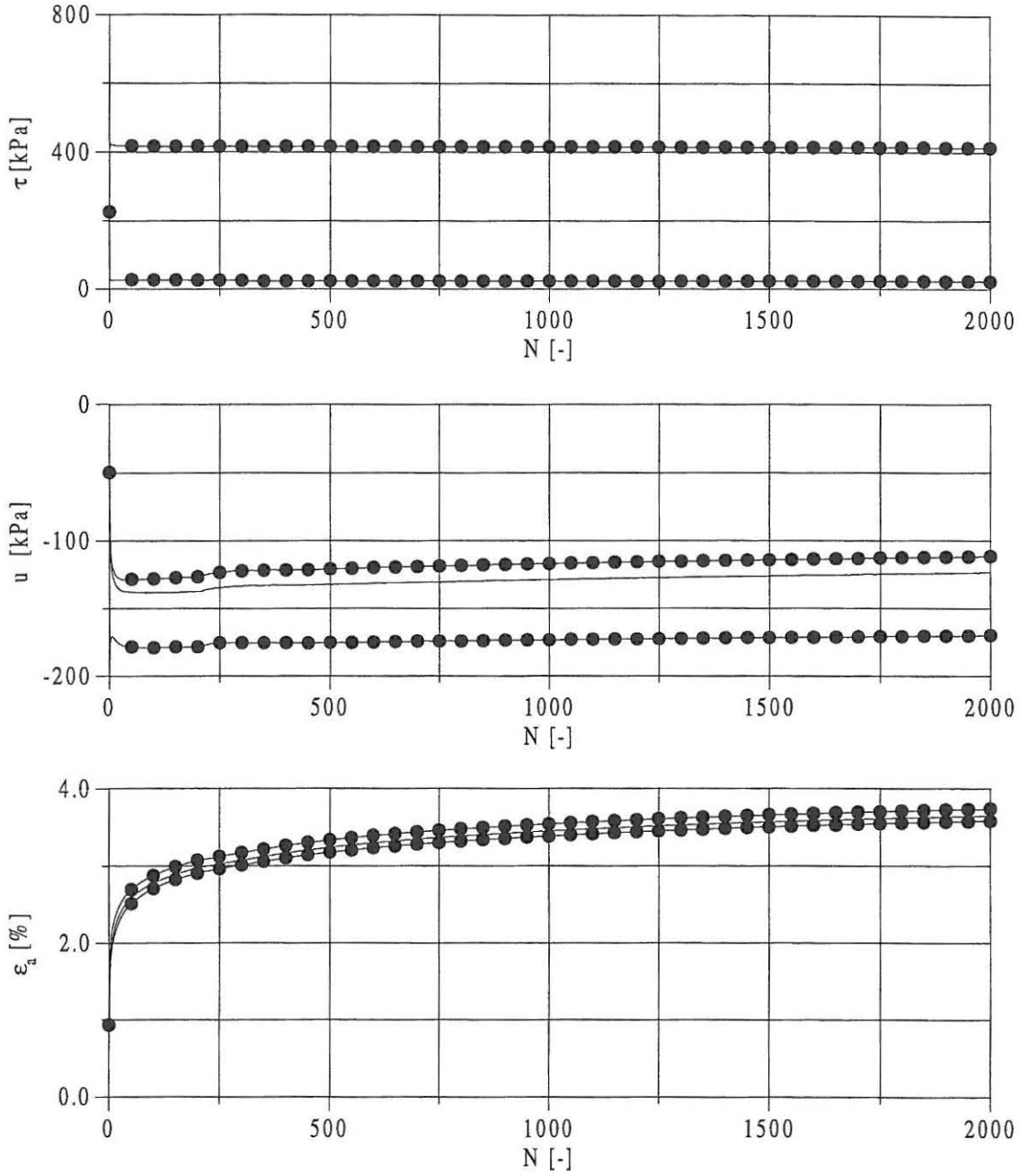
Cyclic Triaxial Test No. 9701.57



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 26
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- — Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 26 Checked: KPJ

Cyclic Triaxial Test No. 9701.58

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm] Diameter [mm]	70.00 70.00	69.94 69.94	64.69 72.67
Calibration file Cal.dat	Date 1998-01-16	Void ratio B-value	0.573	0.569 0.990	0.567

Test program			
	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	225.0	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	193.8	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	325.6	kPa
Pore pressure (u)	200.6	kPa
Axial strain (ε_a)	0.20	%
Volumetric strain (ε_v)	0.61	%

Anisotropic compression		
Shear stress (τ_o)	62.3	kPa
Confining pressure (σ_r)	325.3	kPa
Pore pressure (u)	200.3	kPa
Axial strain (ε_a)	0.53	%
Volumetric strain (ε_v)	0.82	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 27
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.89	%
Volumetric strain (ε_v)	0.97	%

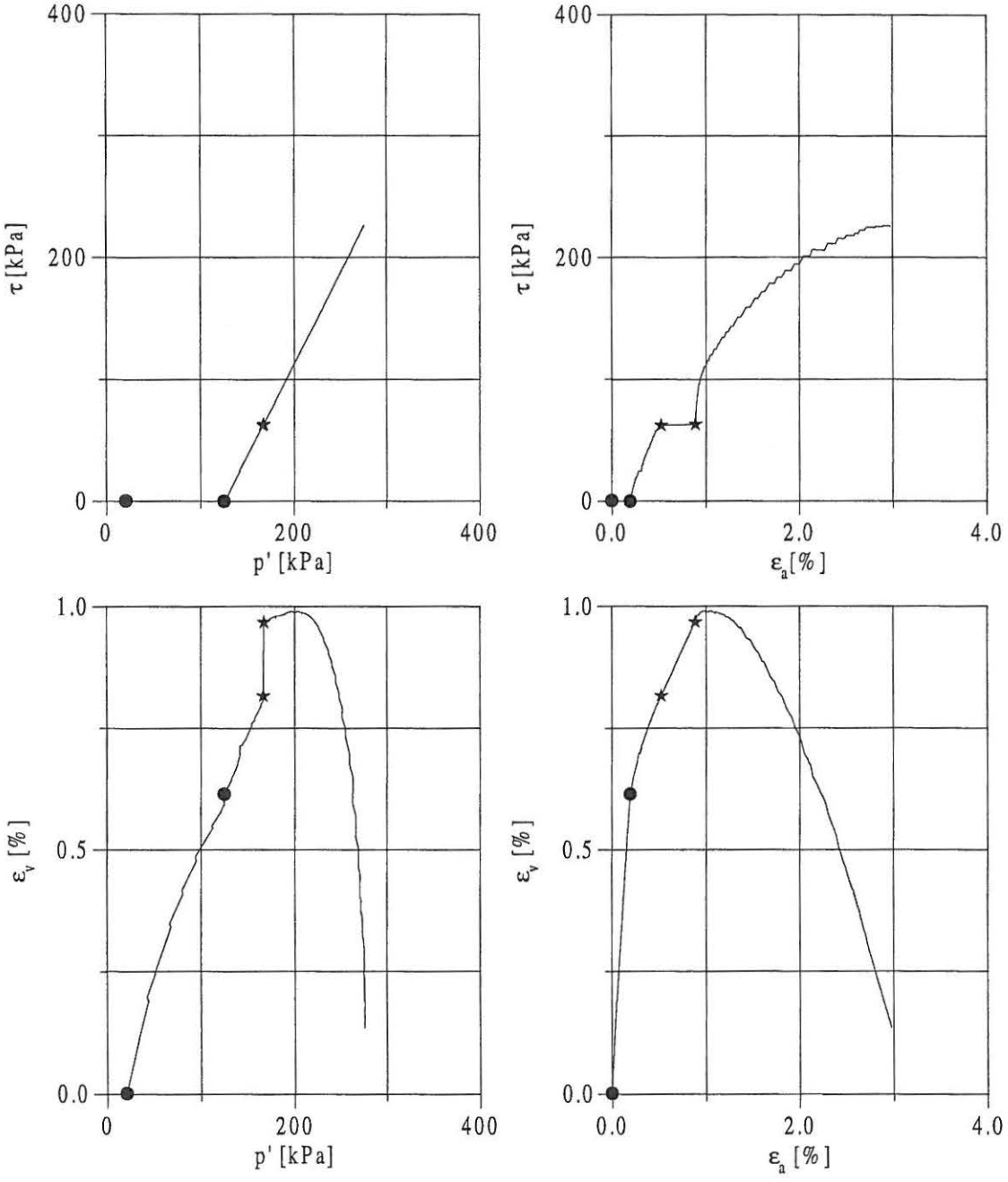
Anisotropic compression	Local	Global	
Shear stress (τ_a)		225.7	kPa
Confining pressure (σ_r)		326.2	kPa
Pore pressure (u)		200.6	kPa
Axial strain (ε_a)	2.03	2.98	%
Volumetric strain (ε_v)	-0.83	0.14	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-9.8	-43.3	-64.0	-86.6	-97.6	kPa
Cyclic pore pressure (u^{cyc})	76.1	49.6	36.9	27.9	27.1	kPa
Permanent axial strain (ε_a^p)	2.54	3.24	3.62	4.11	4.54	%
Cyclic axial strain (ε_a^{cyc})	0.34	0.17	0.15	0.13	0.12	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	-104.6	-109.3	-109.3	-108.9	-108.3	kPa
Cyclic pore pressure (u^{cyc})	27.9	28.9	30.4	31.2	31.8	kPa
Permanent axial strain (ε_a^p)	4.98	5.61	6.17	6.54	6.81	%
Cyclic axial strain (ε_a^{cyc})	0.11	0.10	0.10	0.09	0.09	%
	N=1250	N=1500	N=1750	N=2000		
Permanent pore pressure (u^p)	-107.6	-106.2	-105.2	-104.3		kPa
Cyclic pore pressure (u^{cyc})	32.4	32.8	33.1	33.4		kPa
Permanent axial strain (ε_a^p)	7.03	7.21	7.37	7.50		%
Cyclic axial strain (ε_a^{cyc})	0.09	0.09	0.09	0.09		%

Remarks: Isotropic preconsolidation of 70 kPa

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 27
Evaluated: KPJ	Checked: KPJ

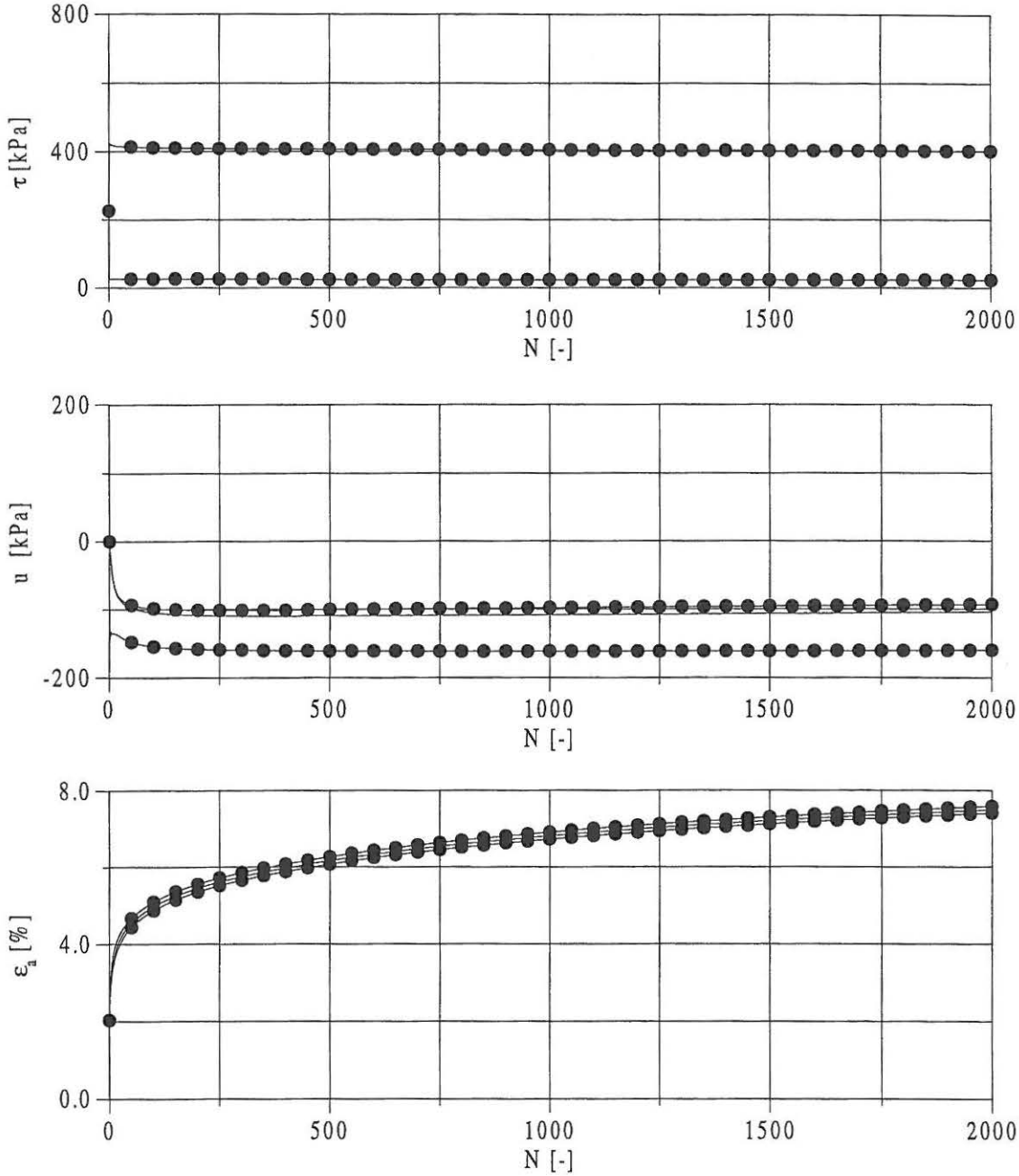
Cyclic Triaxial Test No. 9701.58



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 27
Evaluated: KPJ	Checked: KPJ

Legend

- Isotropic compression
- Anisotropic compression
- Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 27 Checked: KPJ

Cyclic Triaxial Test No. 9701.59

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm]	70.00	69.99	
		Diameter [mm]	70.00	69.99	
Calibration file Cal.dat	Date 1998-01-13	Void ratio	0.573	0.572	
		B-value		0.997	

Test program			
	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	-12.5	kPa
	Loading rate:	5.0	kPa/min
	☐ Applied drained		
	☒ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	25.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	327.9	kPa
Pore pressure (u)	202.9	kPa
Axial strain (ε_a)	0.19	%
Volumetric strain (ε_v)	0.58	%

Anisotropic compression		
Shear stress (τ_o)	62.5	kPa
Confining pressure (σ_r)	328.0	kPa
Pore pressure (u)	203.0	kPa
Axial strain (ε_a)	0.59	%
Volumetric strain (ε_v)	0.82	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 28
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.94	%
Volumetric strain (ε_v)	1.01	%

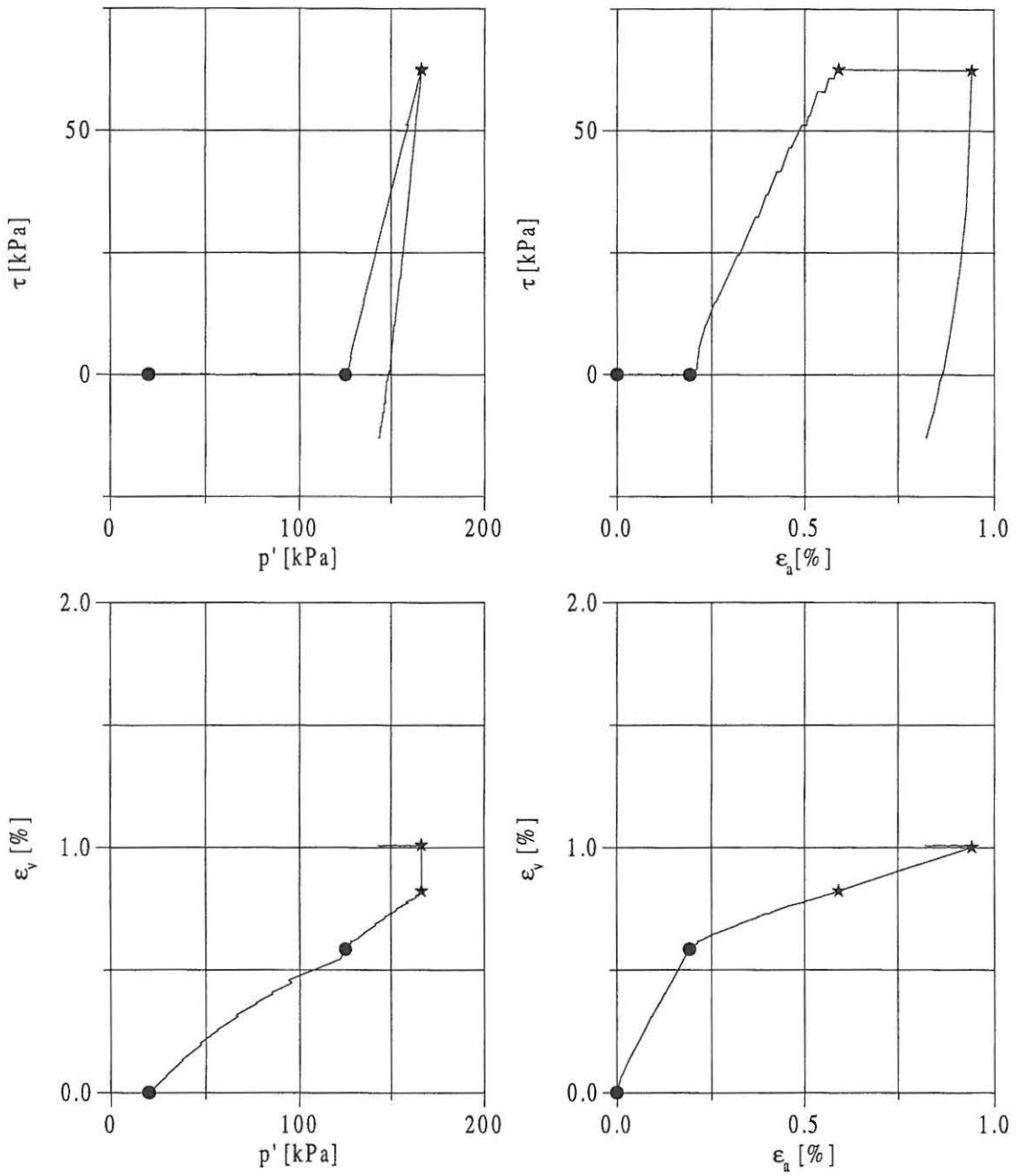
Anisotropic compression	Local	Global	
Shear stress (τ_a)		-12.9	kPa
Confining pressure (σ_r)		328.3	kPa
Pore pressure (u)		176.6	kPa
Axial strain (ε_a)	-0.12	0.82	%
Volumetric strain (ε_v)	0.00	1.01	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-15.8	-4.4	1.5	17.7	29.5	kPa
Cyclic pore pressure (u^{cyc})	21.1	27.4	27.9	27.7	28.3	kPa
Permanent axial strain (ε_a^p)	-0.26	-0.29	-0.32	-0.36	-0.41	%
Cyclic axial strain (ε_a^{cyc})	0.10	0.06	0.06	0.06	0.07	%

	N=100	N=150	
Permanent pore pressure (u^p)	57.4	57.8	kPa
Cyclic pore pressure (u^{cyc})	37.8	134.1	kPa
Permanent axial strain (ε_a^p)	-0.84	-11.01	%
Cyclic axial strain (ε_a^{cyc})	0.17	5.63	%
Permanent pore pressure (u^p)			kPa
Cyclic pore pressure (u^{cyc})			kPa
Permanent axial strain (ε_a^p)			%
Cyclic axial strain (ε_a^{cyc})			%

Remarks: Noise on load signals

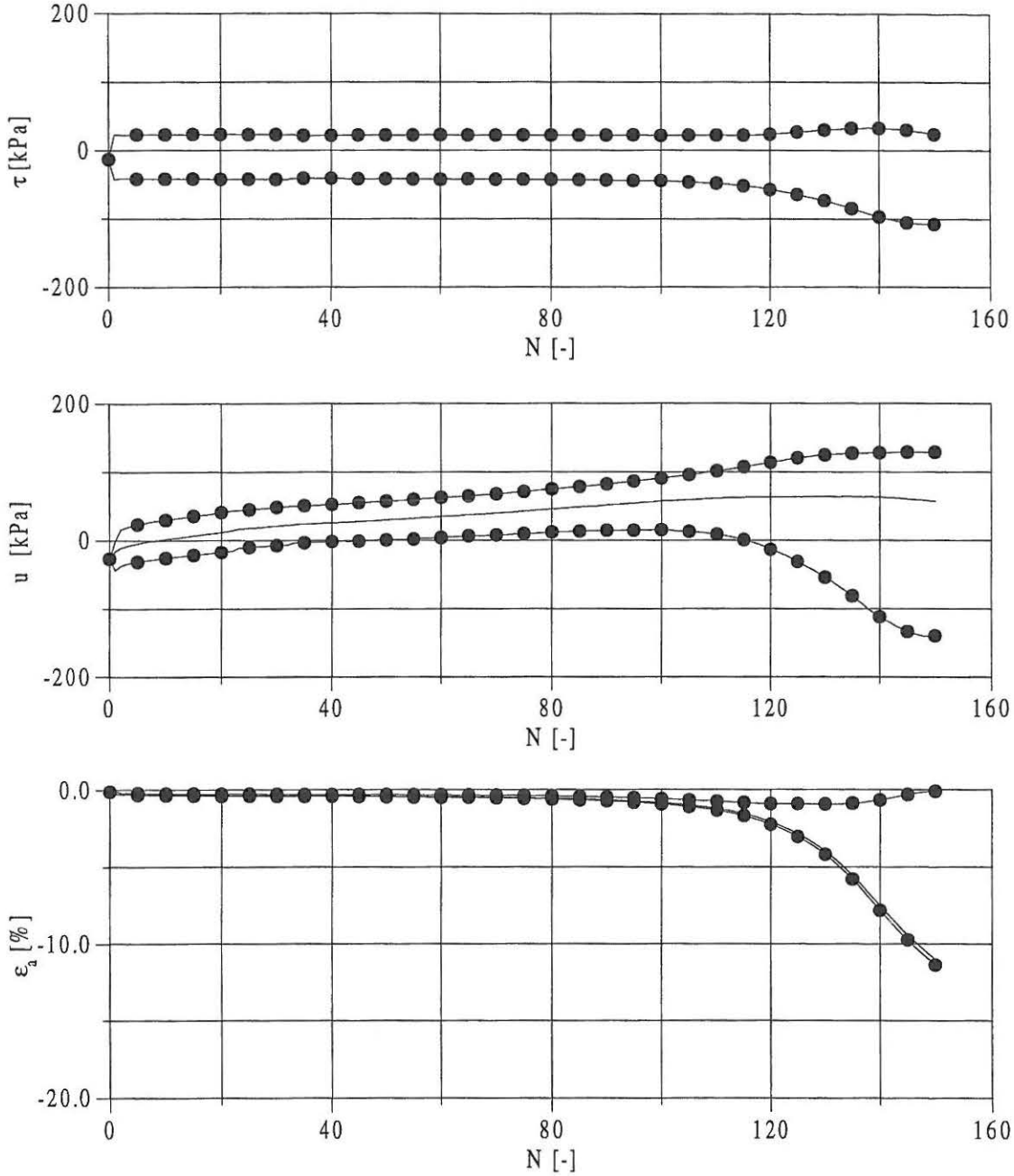
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 28
Evaluated: KPJ	Checked: KPJ



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 28
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- — Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 28
Evaluated: KPJ	Checked: KPJ

Cyclic Triaxial Test No. 9701.60

Description of soil Oosterschelde Sand			Before test	Start test	After test
Cyclic Triaxial Apparatus		Dimension Height [mm] Diameter [mm]	 70.00 70.00	 69.96 69.96	
Calibration file Cal.dat	Date 1998-01-14	Void ratio B-value	0.573	0.570 1.000	

Test program	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	-12.5	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	25.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	325.9	kPa
Pore pressure (u)	200.9	kPa
Axial strain (ε_a)	0.18	%
Volumetric strain (ε_v)	0.56	%

Anisotropic compression		
Shear stress (τ_o)	63.0	kPa
Confining pressure (σ_r)	325.0	kPa
Pore pressure (u)	200.0	kPa
Axial strain (ε_a)	0.54	%
Volumetric strain (ε_v)	0.77	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 29
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.88	%
Volumetric strain (ε_v)	0.90	%

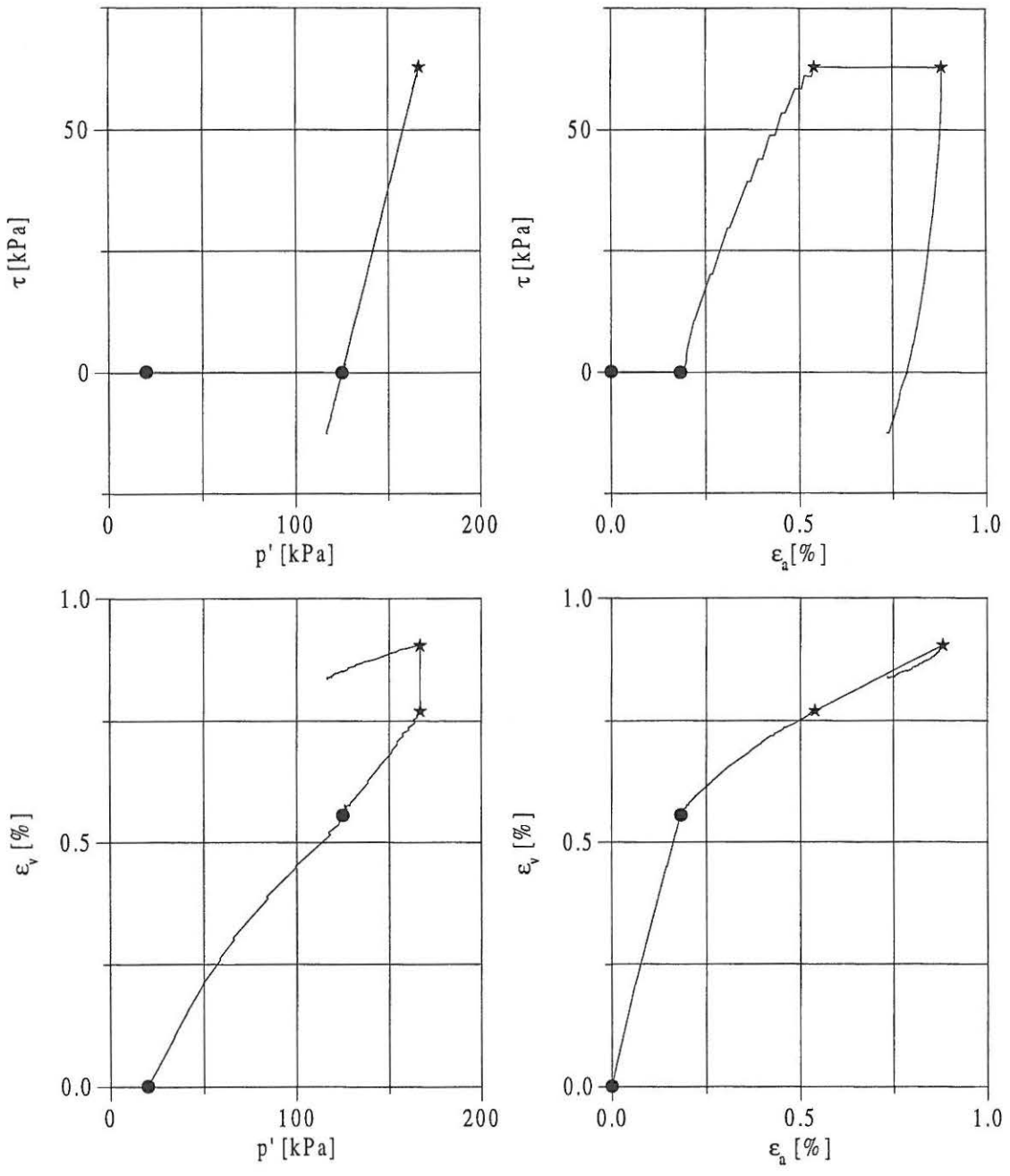
Anisotropic compression	Local	Global	
Shear stress (τ_a)		-12.5	kPa
Confining pressure (σ_r)		325.5	kPa
Pore pressure (u)		200.6	kPa
Axial strain (ε_a)	-0.15	0.73	%
Volumetric strain (ε_v)	-0.06	0.84	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	4.1	15.6	22.1	34.3	49.2	kPa
Cyclic pore pressure (u^{cyc})	24.3	28.7	29.5	31.5	35.7	kPa
Permanent axial strain (ε_a^p)	-0.30	-0.34	-0.37	-0.44	-0.64	%
Cyclic axial strain (ε_a^{cyc})	0.12	0.07	0.07	0.09	0.13	%
	N=100	N=120				
Permanent pore pressure (u^p)	65.6	59.6				kPa
Cyclic pore pressure (u^{cyc})	83.7	126.8				kPa
Permanent axial strain (ε_a^p)	-3.46	-8.53				%
Cyclic axial strain (ε_a^{cyc})	1.26	3.96				%
Permanent pore pressure (u^p)						kPa
Cyclic pore pressure (u^{cyc})						kPa
Permanent axial strain (ε_a^p)						%
Cyclic axial strain (ε_a^{cyc})						%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 29
Evaluated: KPJ	Checked: KPJ

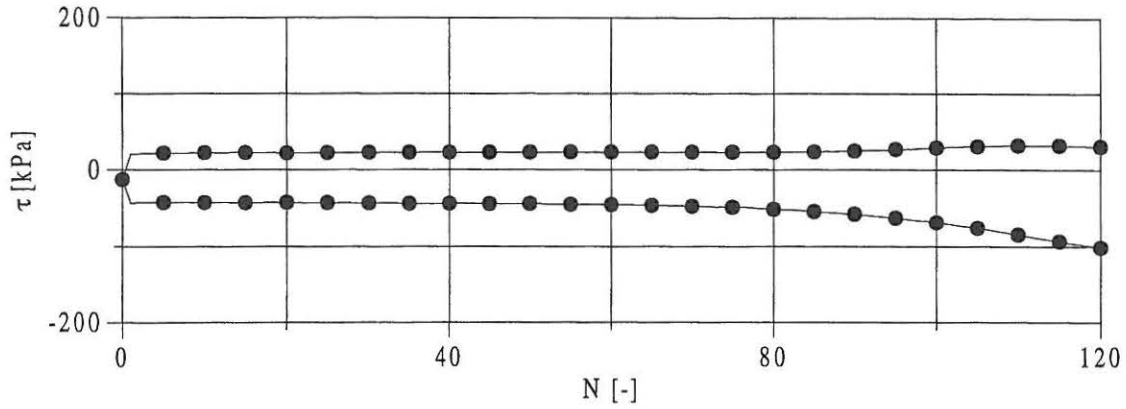
Cyclic Triaxial Test No. 9701.60

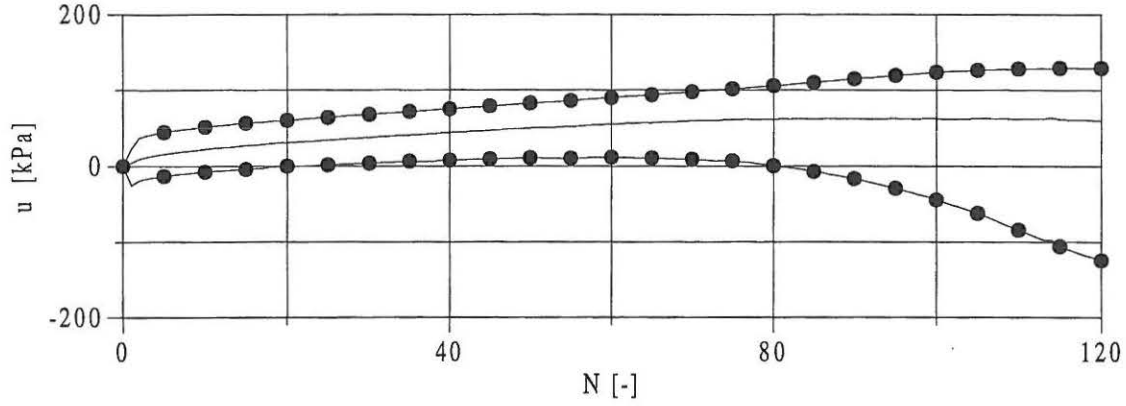


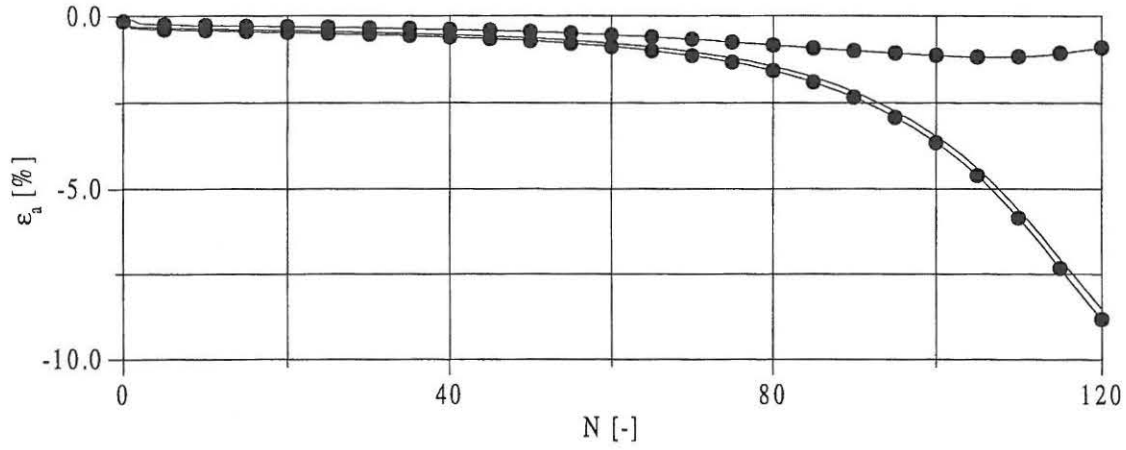
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 29
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling







Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 29 Checked: KPJ

Cyclic Triaxial Test No. 9701.61

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm] Diameter [mm]	70.00 70.00	69.98 69.98	
Calibration file Cal.dat	Date 1998-01-15	Void ratio B-value	0.573	0.571 0.982	

Test program	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	-37.5	kPa
	Loading rate:	5.0	kPa/min
	☐ Applied drained		
	☒ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	50.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	326.1	kPa
Pore pressure (u)	301.1	kPa
Axial strain (ε_a)	0.12	%
Volumetric strain (ε_v)	0.46	%

Anisotropic compression		
Shear stress (τ_o)	62.9	kPa
Confining pressure (σ_r)	325.6	kPa
Pore pressure (u)	200.6	kPa
Axial strain (ε_a)	0.39	%
Volumetric strain (ε_v)	0.66	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 30
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.68	%
Volumetric strain (ε_v)	0.90	%

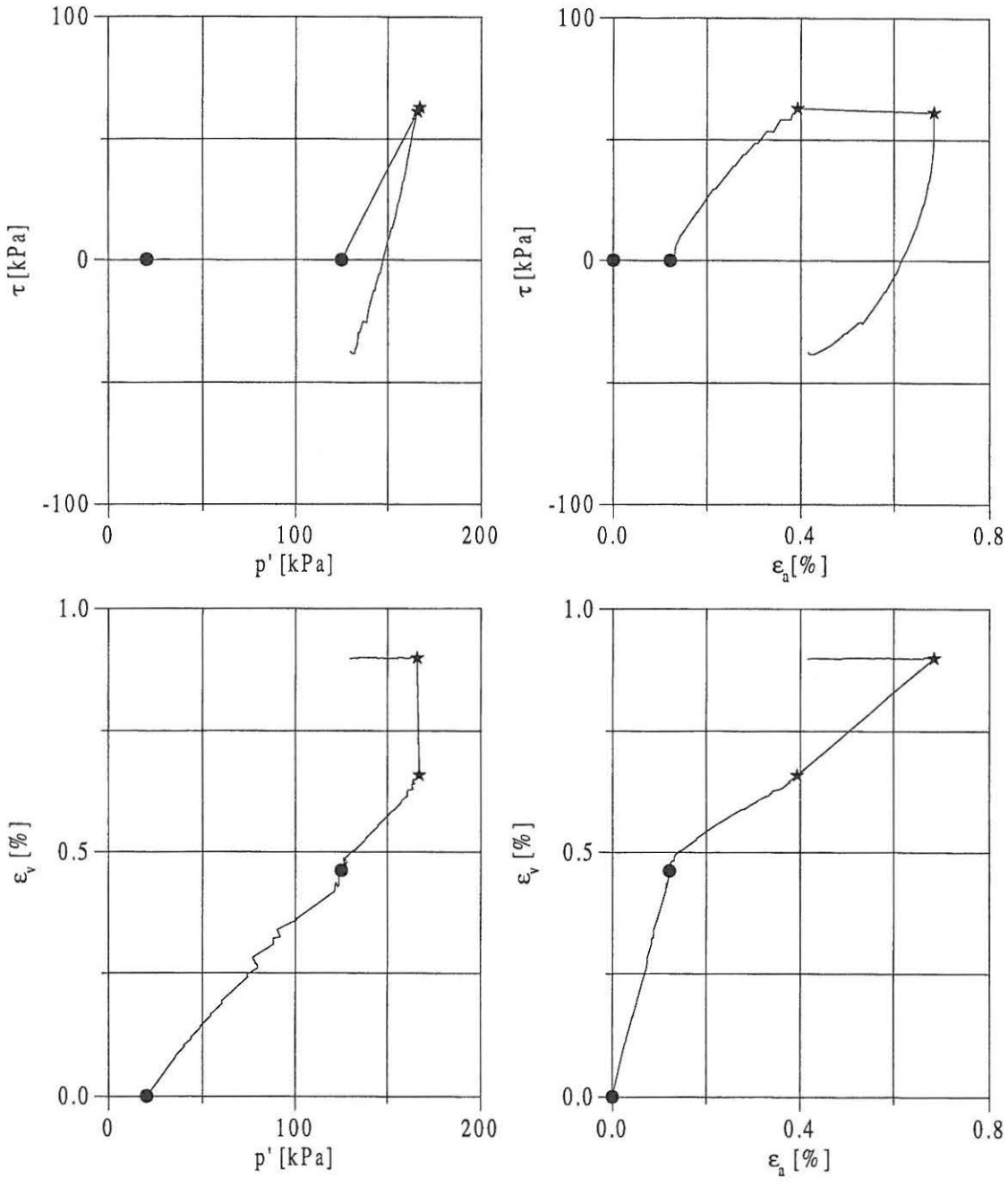
Anisotropic compression	Local	Global	
Shear stress (τ_a)		-37.4	kPa
Confining pressure (σ_r)		325.6	kPa
Pore pressure (u)		171.0	kPa
Axial strain (ε_a)	-0.26	0.42	%
Volumetric strain (ε_v)	0.00	0.90	%

Cyclic loading	N=1	N=5	N=10	N=25	N=32	
Permanent pore pressure (u^p)	-48.4	-35.1	-31.7	-38.7	-58.8	kPa
Cyclic pore pressure (u^{cyc})	102.4	109.1	118.5	163.0	185.0	kPa
Permanent axial strain (ε_a^p)	-1.61	-2.40	-3.38	-7.09	-10.2	%
Cyclic axial strain (ε_a^{cyc})	0.41	0.48	0.69	1.82	2.58	%
Permanent pore pressure (u^p)						kPa
Cyclic pore pressure (u^{cyc})						kPa
Permanent axial strain (ε_a^p)						%
Cyclic axial strain (ε_a^{cyc})						%
Permanent pore pressure (u^p)						kPa
Cyclic pore pressure (u^{cyc})						kPa
Permanent axial strain (ε_a^p)						%
Cyclic axial strain (ε_a^{cyc})						%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 30
Evaluated: KPJ	Checked: KPJ

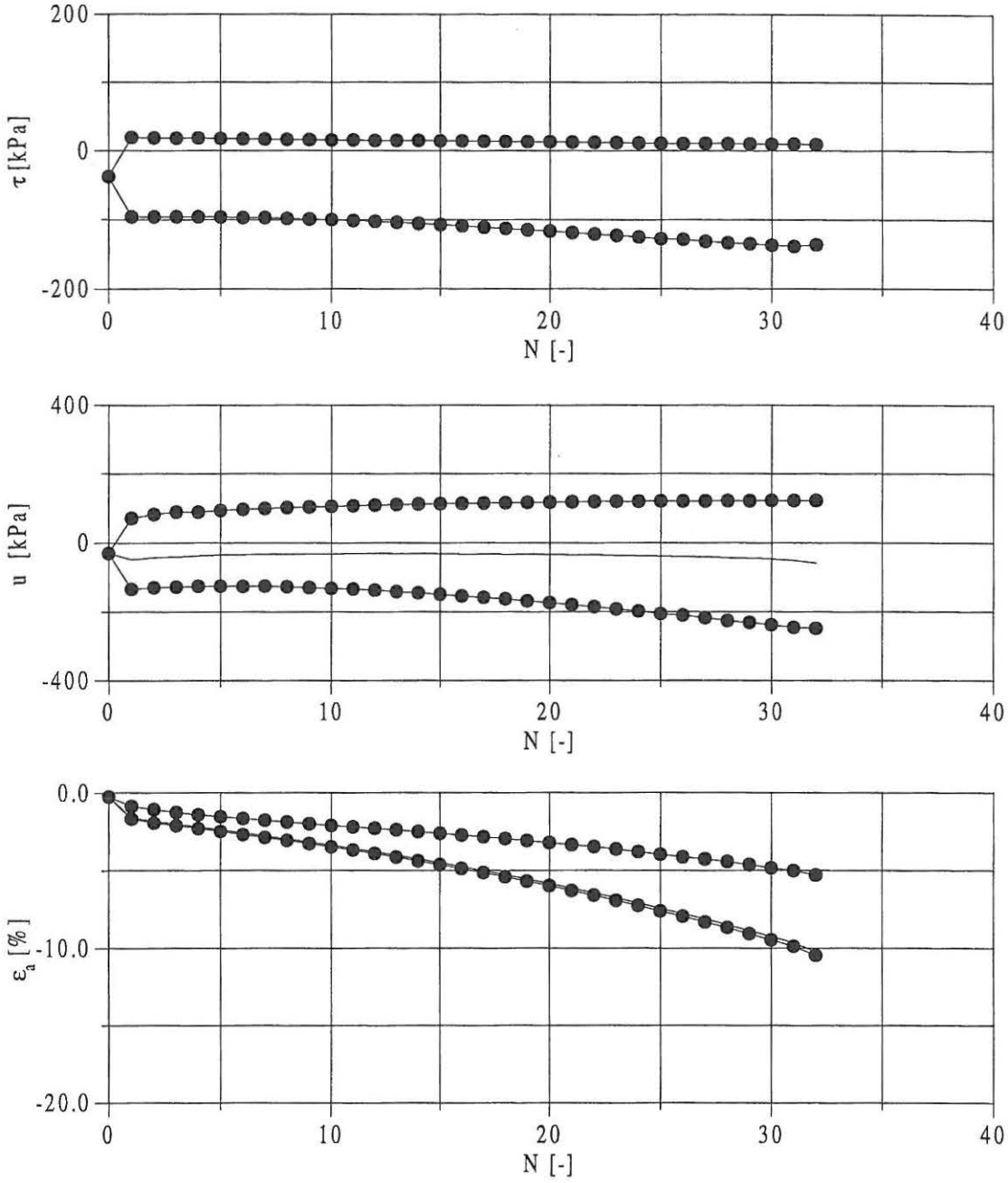
Cyclic Triaxial Test No. 9701.61



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 30
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 30
Evaluated: KPJ	Checked: KPJ

Cyclic Triaxial Test No. 9701.62

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm]	71.50	71.48	67.55
		Diameter [mm]	69.70	69.68	71.47
Calibration file Cal.dat	Date 1998-01-19	Void ratio	0.619	0.618	0.608
		B-value		0.986	

Test program			
	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	62.5	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	121.9	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	325.0	kPa
Pore pressure (u)	200.0	kPa
Axial strain (ε_a)	0.12	%
Volumetric strain (ε_v)	0.41	%

Anisotropic compression		
Shear stress (τ_o)	62.9	kPa
Confining pressure (σ_r)	325.1	kPa
Pore pressure (u)	200.0	kPa
Axial strain (ε_a)	0.31	%
Volumetric strain (ε_v)	0.52	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 31
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.50	%
Volumetric strain (ε_v)	0.58	%

Anisotropic compression	Local	Global	
Shear stress (τ_a)		62.7	kPa
Confining pressure (σ_r)		324.9	kPa
Pore pressure (u)		199.9	kPa
Axial strain (ε_a)	0.00	0.50	%
Volumetric strain (ε_v)	0.00	0.58	%

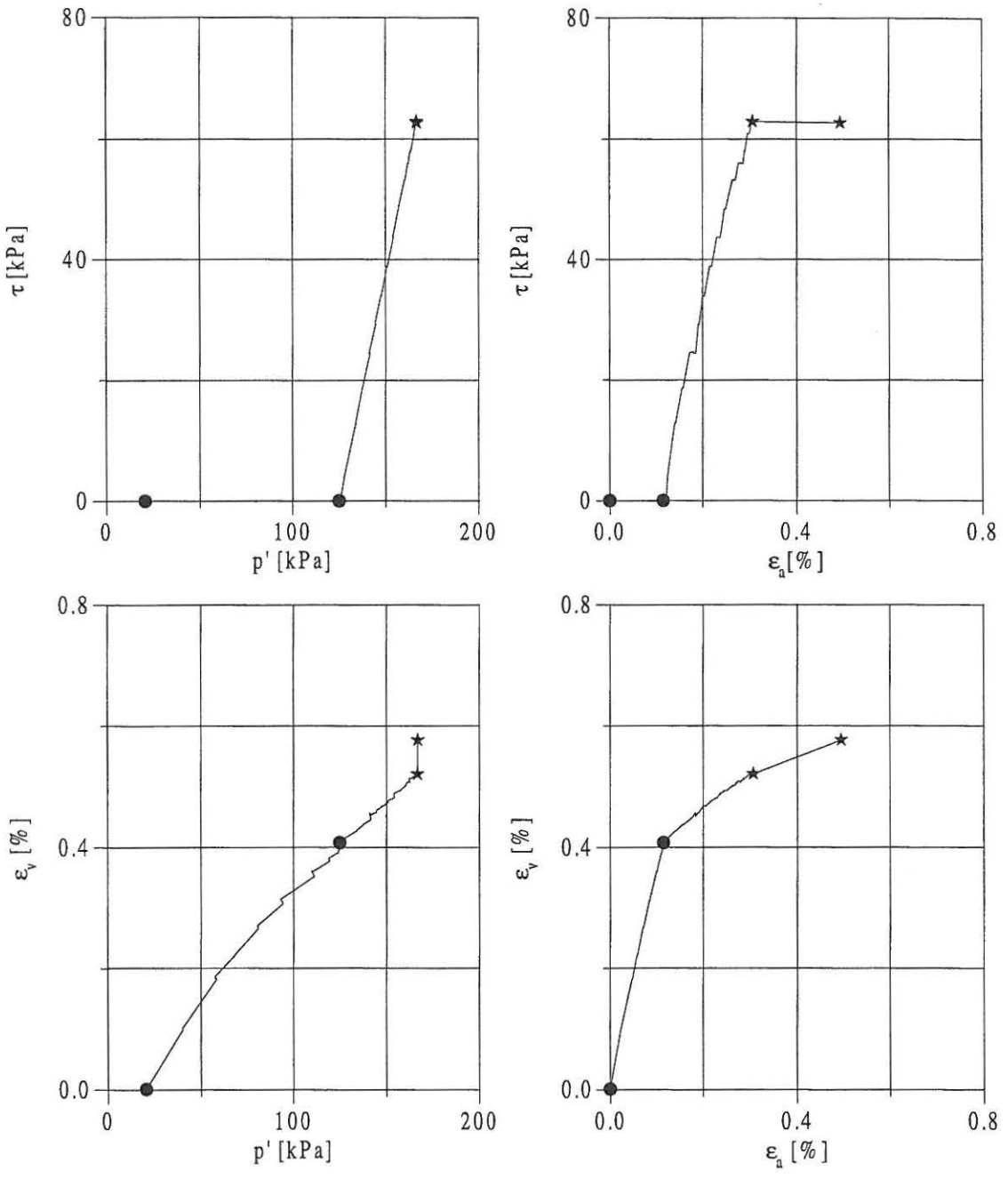
Cyclic loading	N=1	N=5	N=10	N=25	N=32	
Permanent pore pressure (u^p)	77.6	104.2	112.5	117.5	117.4	kPa
Cyclic pore pressure (u^{cyc})	68.2	110.7	132.8	164.4	162.3	kPa
Permanent axial strain (ε_a^p)	0.09	0.45	0.99	4.09	5.00	%
Cyclic axial strain (ε_a^{cyc})	0.57	1.50	2.54	5.26	5.93	%

Permanent pore pressure (u^p)	kPa
Cyclic pore pressure (u^{cyc})	kPa
Permanent axial strain (ε_a^p)	%
Cyclic axial strain (ε_a^{cyc})	%

Permanent pore pressure (u^p)	kPa
Cyclic pore pressure (u^{cyc})	kPa
Permanent axial strain (ε_a^p)	%
Cyclic axial strain (ε_a^{cyc})	%

Remarks: Necking after 32 cycles

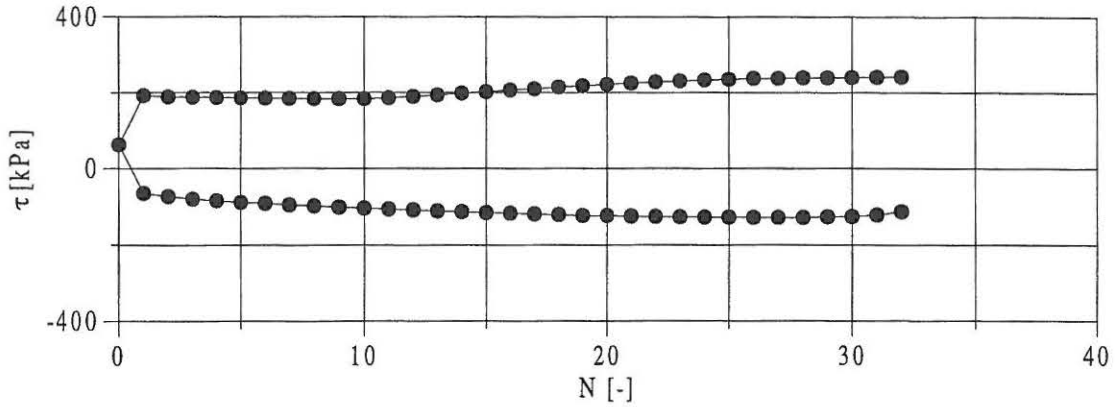
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 31
Evaluated: KPJ	Checked: KPJ

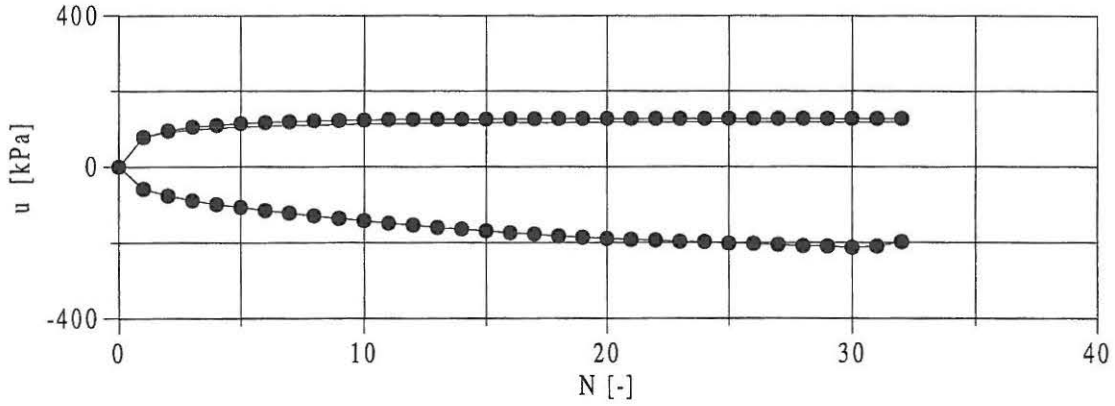


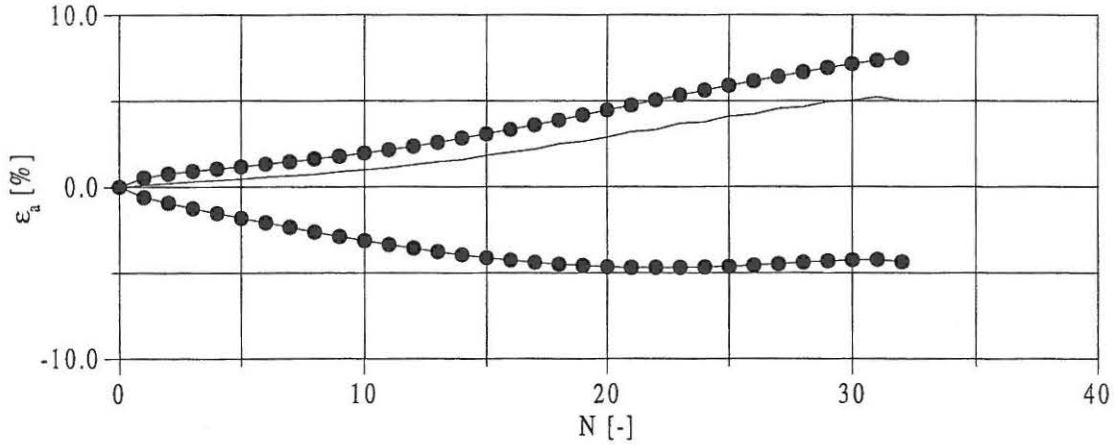
Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 31
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- — Anisotropic compression
- ★ Precycling







Remarks

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 31
Evaluated: KPJ	Checked: KPJ

Cyclic Triaxial Test No. 9701.63

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm] Diameter [mm]	71.50 69.70	71.50 69.70	69.90 70.30
Calibration file Cal.dat	Date 1998-01-18	Void ratio B-value	0.619	0.619 0.979	0.610

Test program			
	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	62.5	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	56.3	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	425.3	kPa
Pore pressure (u)	300.3	kPa
Axial strain (ε_a)	0.10	%
Volumetric strain (ε_v)	0.37	%

Anisotropic compression		
Shear stress (τ_o)	62.5	kPa
Confining pressure (σ_r)	425.3	kPa
Pore pressure (u)	200.3	kPa
Axial strain (ε_a)	0.28	%
Volumetric strain (ε_v)	0.49	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 32
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.46	%
Volumetric strain (ε_v)	0.55	%

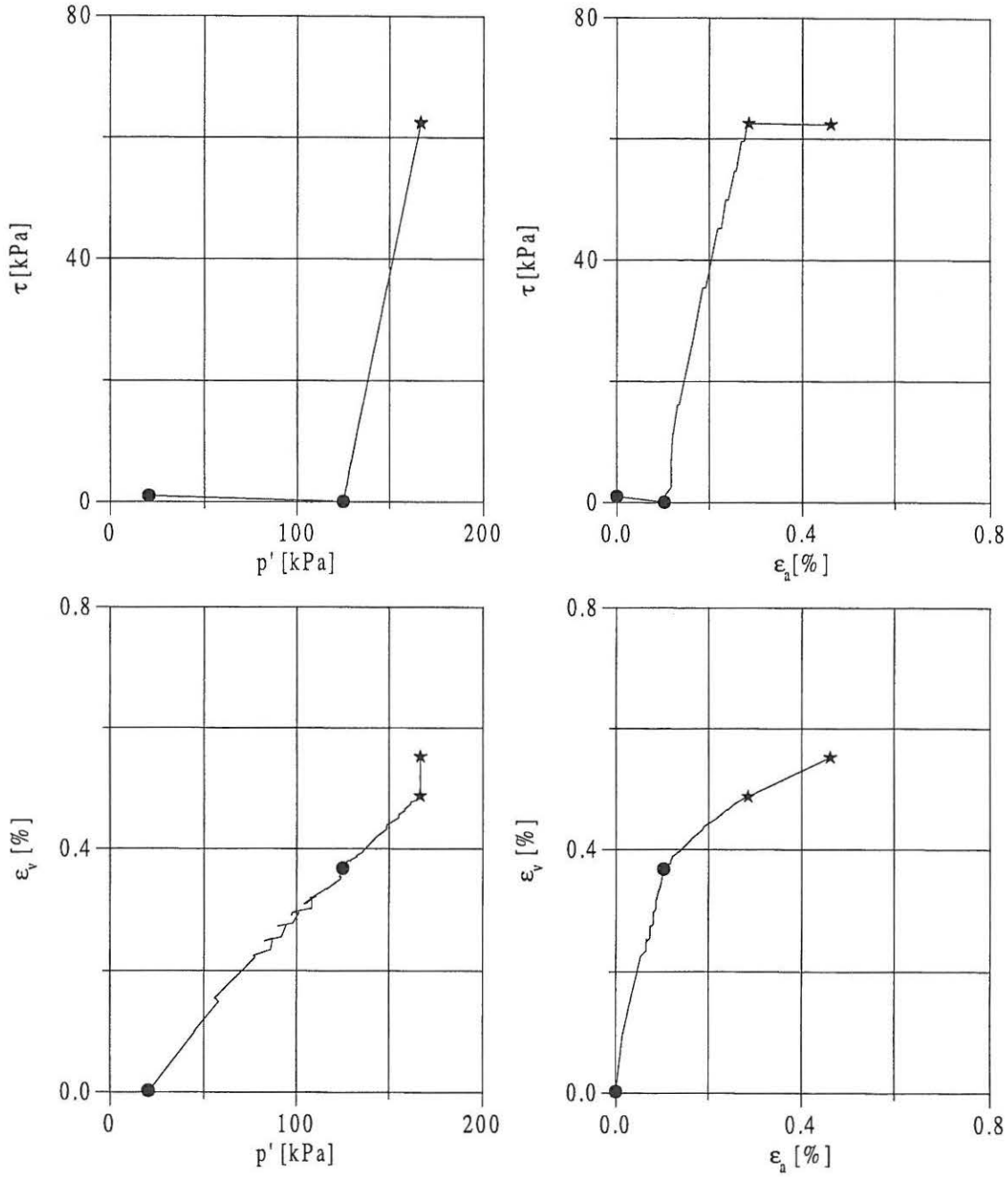
Anisotropic compression	Local	Global	
Shear stress (τ_a)		62.5	kPa
Confining pressure (σ_r)		425.6	kPa
Pore pressure (u)		300.6	kPa
Axial strain (ε_a)	0.00	0.46	%
Volumetric strain (ε_v)	0.00	0.55	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	8.1	20.5	27.2	36.0	42.7	kPa
Cyclic pore pressure (u^{cyc})	15.0	17.0	16.9	16.2	15.8	kPa
Permanent axial strain (ε_a^p)	0.06	0.16	0.22	0.36	0.50	%
Cyclic axial strain (ε_a^{cyc})	0.06	0.04	0.04	0.04	0.04	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	48.3	53.9	57.0	59.0	59.8	kPa
Cyclic pore pressure (u^{cyc})	15.5	15.2	15.0	14.9	15.0	kPa
Permanent axial strain (ε_a^p)	0.68	0.99	1.25	1.41	1.52	%
Cyclic axial strain (ε_a^{cyc})	0.04	0.04	0.04	0.04	0.04	%
	N=1250	N=1500	N=1750	N=2000		
Permanent pore pressure (u^p)	117.7	61.4	62.0	63.1		kPa
Cyclic pore pressure (u^{cyc})	14.9	15.0	15.1	15.1		kPa
Permanent axial strain (ε_a^p)	1.61	1.67	1.73	1.78		%
Cyclic axial strain (ε_a^{cyc})	0.04	0.04	0.04	0.04		%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 32
Evaluated: KPJ	Checked: KPJ

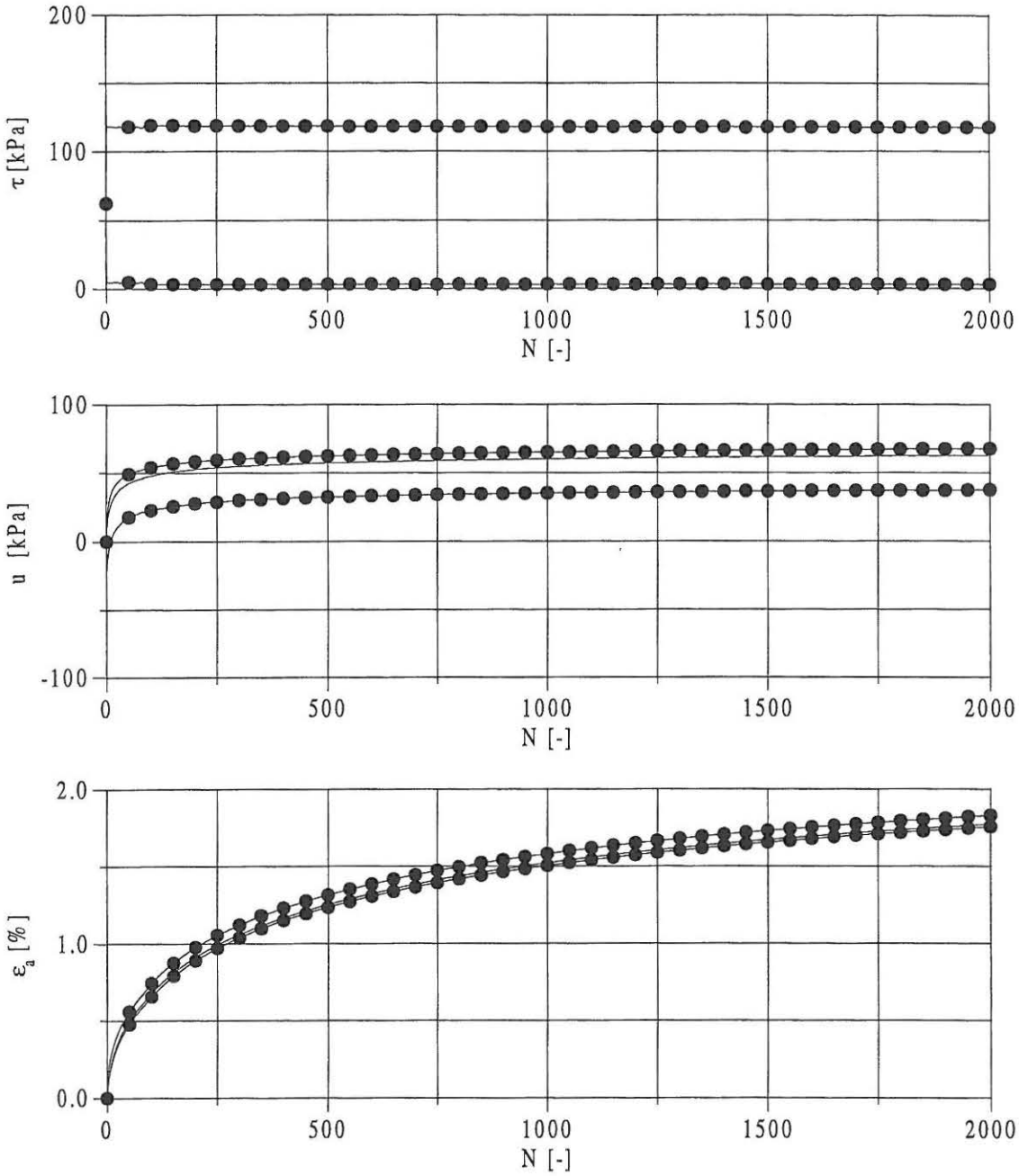
Cyclic Triaxial Test No. 9701.63



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 32
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 32
Evaluated: KPJ	Checked: KPJ

Cyclic Triaxial Test No. 9701.64

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm] Diameter [mm]	71.50 69.70	71.48 69.68	66.67 71.87
Calibration file Cal.dat	Date 1998-01-20	Void ratio B-value	0.619	0.617 0.987	0.605

Test program			
	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	200.0	kPa
	Loading rate:	5.0	kPa/min
	☐ Applied drained		
	☒ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	168.8	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	325.2	kPa
Pore pressure (u)	200.2	kPa
Axial strain (ε_a)	0.11	%
Volumetric strain (ε_v)	0.41	%

Anisotropic compression		
Shear stress (τ_o)	62.9	kPa
Confining pressure (σ_r)	325.3	kPa
Pore pressure (u)	200.2	kPa
Axial strain (ε_a)	0.49	%
Volumetric strain (ε_v)	0.61	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 33
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.59	%
Volumetric strain (ε_v)	0.77	%

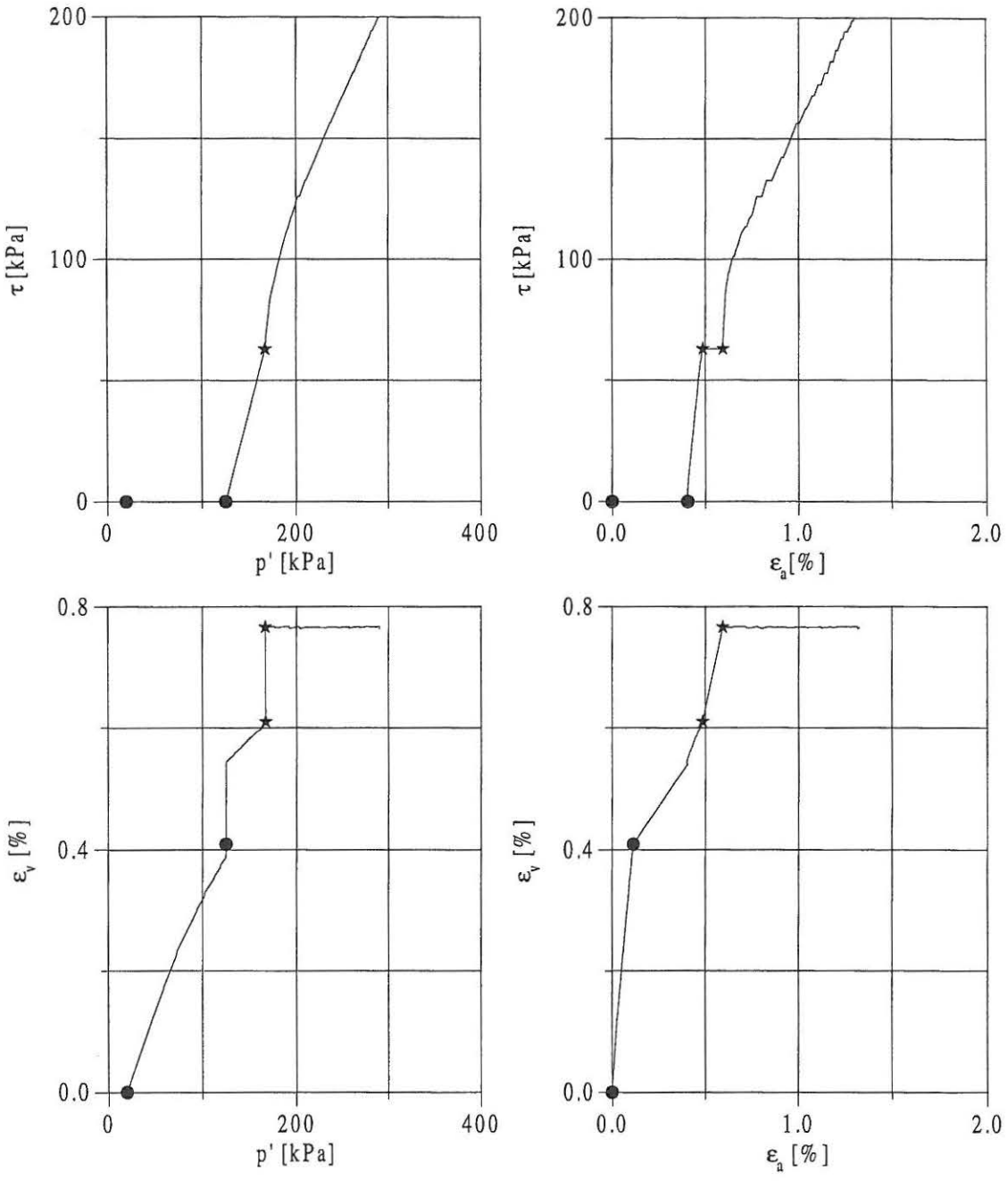
Anisotropic compression	Local	Global	
Shear stress (τ_a)		199.9	kPa
Confining pressure (σ_r)		325.1	kPa
Pore pressure (u)		168.1	kPa
Axial strain (ε_a)	0.74	1.33	%
Volumetric strain (ε_v)	0.00	0.77	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-62.4	-83.4	-91.9	-98.6	-100.8	kPa
Cyclic pore pressure (u^{cyc})	69.7	38.2	34.2	33.5	34.2	kPa
Permanent axial strain (ε_a^p)	1.31	1.80	2.06	2.45	2.79	%
Cyclic axial strain (ε_a^{cyc})	0.35	0.12	0.11	0.10	0.09	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	-99.7	-95.9	-86.6	-82.2	-77.8	kPa
Cyclic pore pressure (u^{cyc})	35.1	35.2	35.5	35.7	35.5	kPa
Permanent axial strain (ε_a^p)	3.17	3.75	4.32	4.72	5.05	%
Cyclic axial strain (ε_a^{cyc})	0.09	0.08	0.08	0.08	0.08	%
	N=1250	N=1500	N=1750	N=2000		
Permanent pore pressure (u^p)	-74.9	-72.0	-69.8	-67.7		kPa
Cyclic pore pressure (u^{cyc})	35.9	35.9	35.9	35.8		kPa
Permanent axial strain (ε_a^p)	5.35	5.64	5.90	6.14		%
Cyclic axial strain (ε_a^{cyc})	0.08	0.08	0.07	0.07		%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 33
Evaluated: KPJ	Checked: KPJ

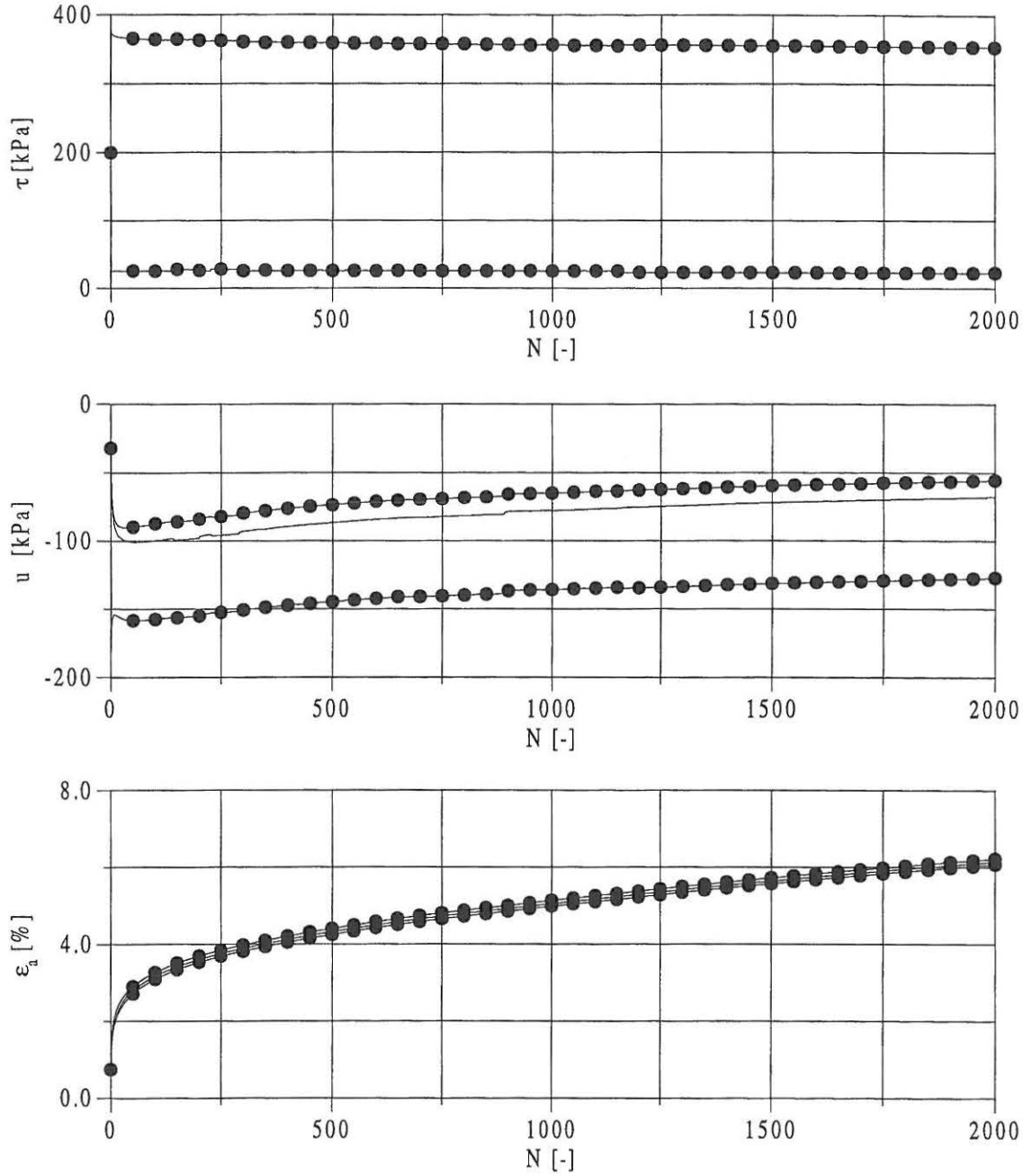
Cyclic Triaxial Test No. 9701.64



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 33
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 33 Checked: KPJ

Cyclic Triaxial Test No. 9701.65

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm] Diameter [mm]	71.50 69.70	71.47 69.67	
Calibration file Cal.dat	Date 1998-01-23	Void ratio B-value	0.619	0.617 0.980	

Test program			
	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	-25.0	kPa
	Loading rate:	5.0	kPa/min
	☐ Applied drained		
	☒ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	37.5	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	325.1	kPa
Pore pressure (u)	200.1	kPa
Axial strain (ε_a)	0.11	%
Volumetric strain (ε_v)	0.35	%

Anisotropic compression		
Shear stress (τ_o)	62.5	kPa
Confining pressure (σ_r)	325.0	kPa
Pore pressure (u)	200.0	kPa
Axial strain (ε_a)	0.31	%
Volumetric strain (ε_v)	0.48	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 34
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.46	%
Volumetric strain (ε_v)	0.53	%

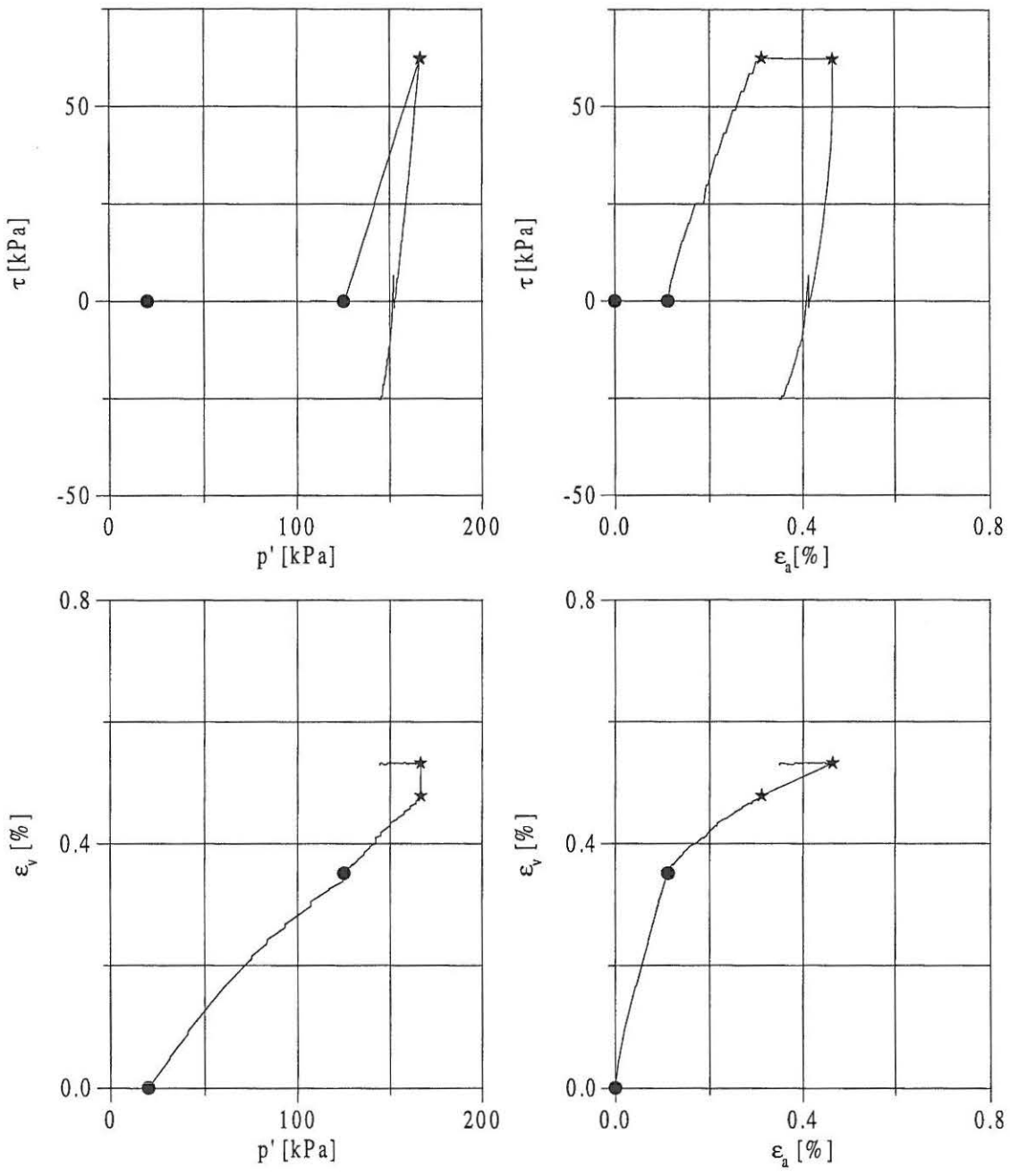
Anisotropic compression	Local	Global	
Shear stress (τ_a)		-25.2'	kPa
Confining pressure (σ_r)		325.1	kPa
Pore pressure (u)		164.1	kPa
Axial strain (ε_a)	-0.11	0.35	%
Volumetric strain (ε_v)	0.00	0.53	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-24.7	-3.7	6.9	20.4	17.3	kPa
Cyclic pore pressure (u^{cyc})	34.8	55.7	61.2	78.8	133.8	kPa
Permanent axial strain (ε_a^p)	-0.49	-0.79	-1.11	-2.28	-7.23	%
Cyclic axial strain (ε_a^{cyc})	0.22	0.13	0.15	0.34	1.88	%
	N=71					
Permanent pore pressure (u^p)	5.4					kPa
Cyclic pore pressure (u^{cyc})	160.1					kPa
Permanent axial strain (ε_a^p)	-13.90					%
Cyclic axial strain (ε_a^{cyc})	3.48					%
Permanent pore pressure (u^p)						kPa
Cyclic pore pressure (u^{cyc})						kPa
Permanent axial strain (ε_a^p)						%
Cyclic axial strain (ε_a^{cyc})						%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 34
Evaluated: KPJ	Checked: KPJ

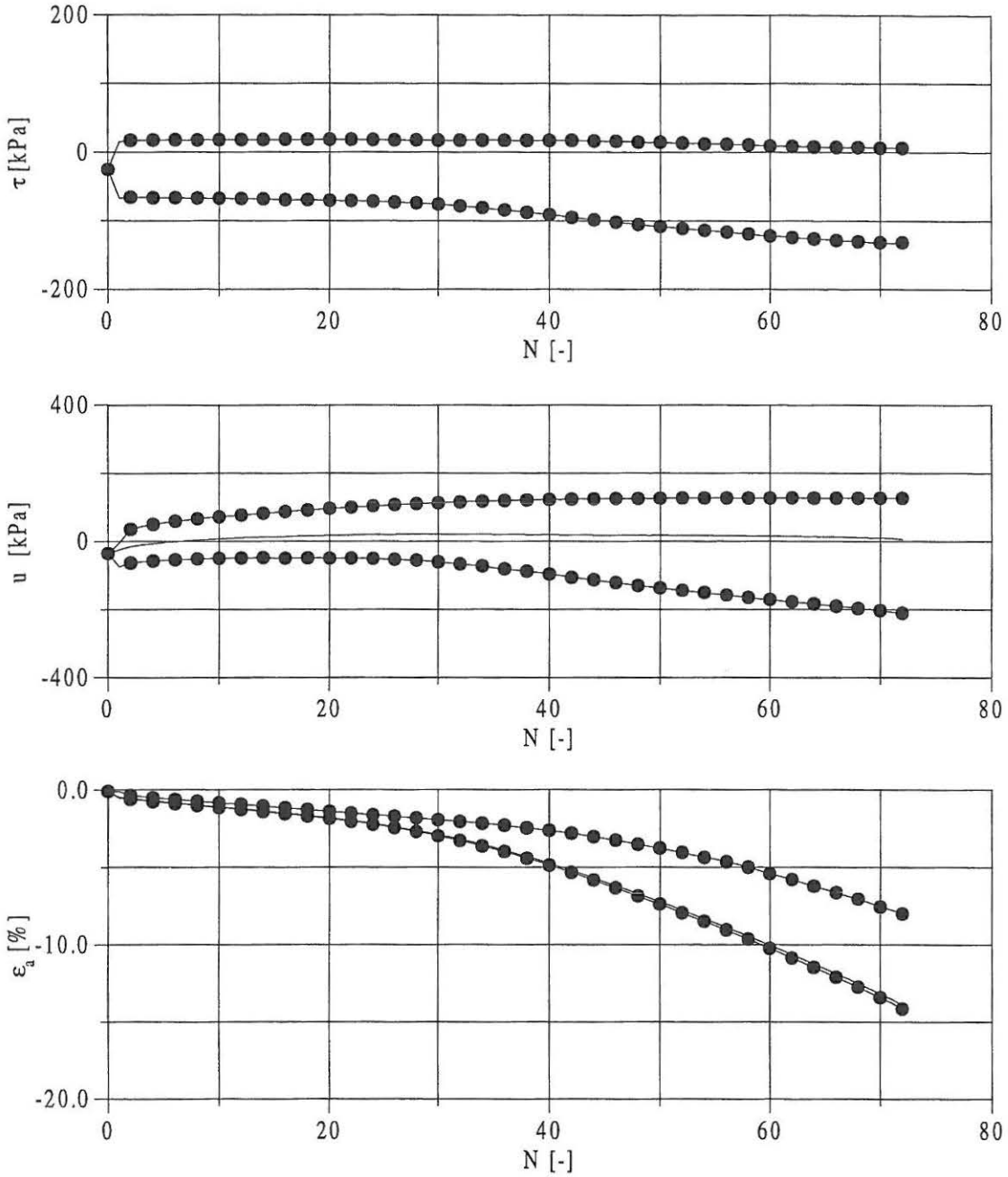
Cyclic Triaxial Test No. 9701.65



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 34
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- —— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 34
Evaluated: KPJ	Checked: KPJ

Cyclic Triaxial Test No. 9701.66

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm] Diameter [mm]	71.50 69.70	71.50 69.70	70.00 70.24
Calibration file Cal.dat	Date 1998-01-22	Void ratio B-value	0.619	0.619 0.983	0.610

Test program	Isotropic consolidation, σ'_r :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	125.0	kPa
	Loading rate:	5.0	kPa/min
	☐ Applied drained		
	☒ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	75.0	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	325.0	kPa
Pore pressure (u)	200.0	kPa
Axial strain (ε_a)	0.11	%
Volumetric strain (ε_v)	0.35	%

Anisotropic compression		
Shear stress (τ_o)	62.3	kPa
Confining pressure (σ_r)	325.0	kPa
Pore pressure (u)	200.0	kPa
Axial strain (ε_a)	0.35	%
Volumetric strain (ε_v)	0.49	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 35
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.67	%
Volumetric strain (ε_v)	0.58	%

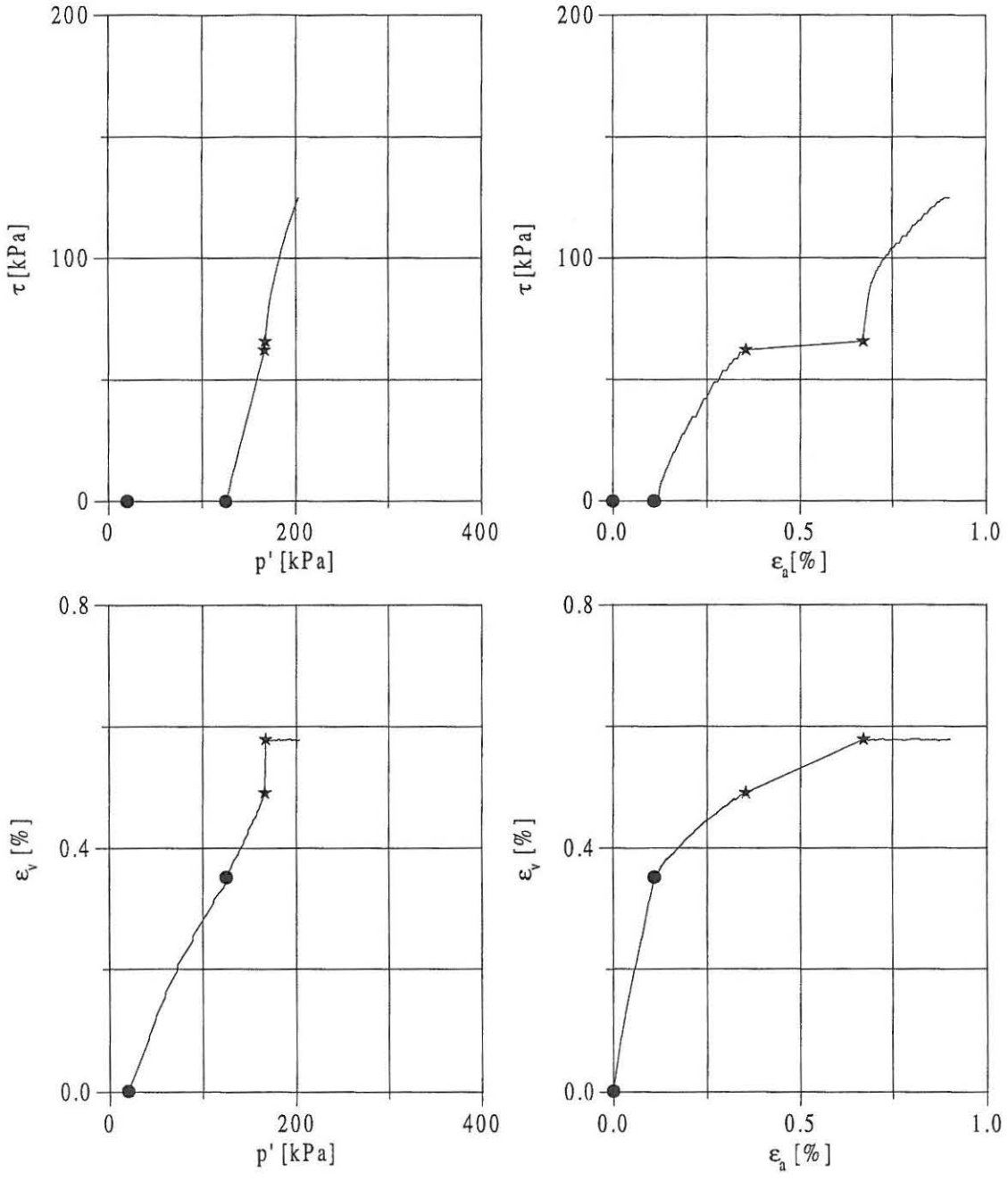
Anisotropic compression	Local	Global	
Shear stress (τ_a)		124.9	kPa
Confining pressure (σ_r)		325.0	kPa
Pore pressure (u)		205.0	kPa
Axial strain (ε_a)	0.23	0.90	%
Volumetric strain (ε_v)	0.00	0.58	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-24.0	-25.8	-26.5	-26.5	-25.4	kPa
Cyclic pore pressure (u^{cyc})	29.7	17.4	17.8	18.5	19.0	kPa
Permanent axial strain (ε_a^p)	0.57	0.73	0.82	0.94	1.03	%
Cyclic axial strain (ε_a^{cyc})	0.20	0.05	0.05	0.05	0.05	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	-24.2	-22.0	-21.6	-22.9	-24.8	kPa
Cyclic pore pressure (u^{cyc})	19.2	19.2	19.3	19.7	20.1	kPa
Permanent axial strain (ε_a^p)	1.12	1.23	1.32	1.36	1.38	%
Cyclic axial strain (ε_a^{cyc})	0.05	0.04	0.04	0.04	0.04	%
	N=1250	N=1500	N=1750	N=2000		
Permanent pore pressure (u^p)	-27.7	-30.9	-34.6	-38.4		kPa
Cyclic pore pressure (u^{cyc})	20.3	20.8	21.6	21.9		kPa
Permanent axial strain (ε_a^p)	1.40	1.41	1.42	1.43		%
Cyclic axial strain (ε_a^{cyc})	0.04	0.04	0.04	0.04		%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 35
Evaluated: KPJ	Checked: KPJ

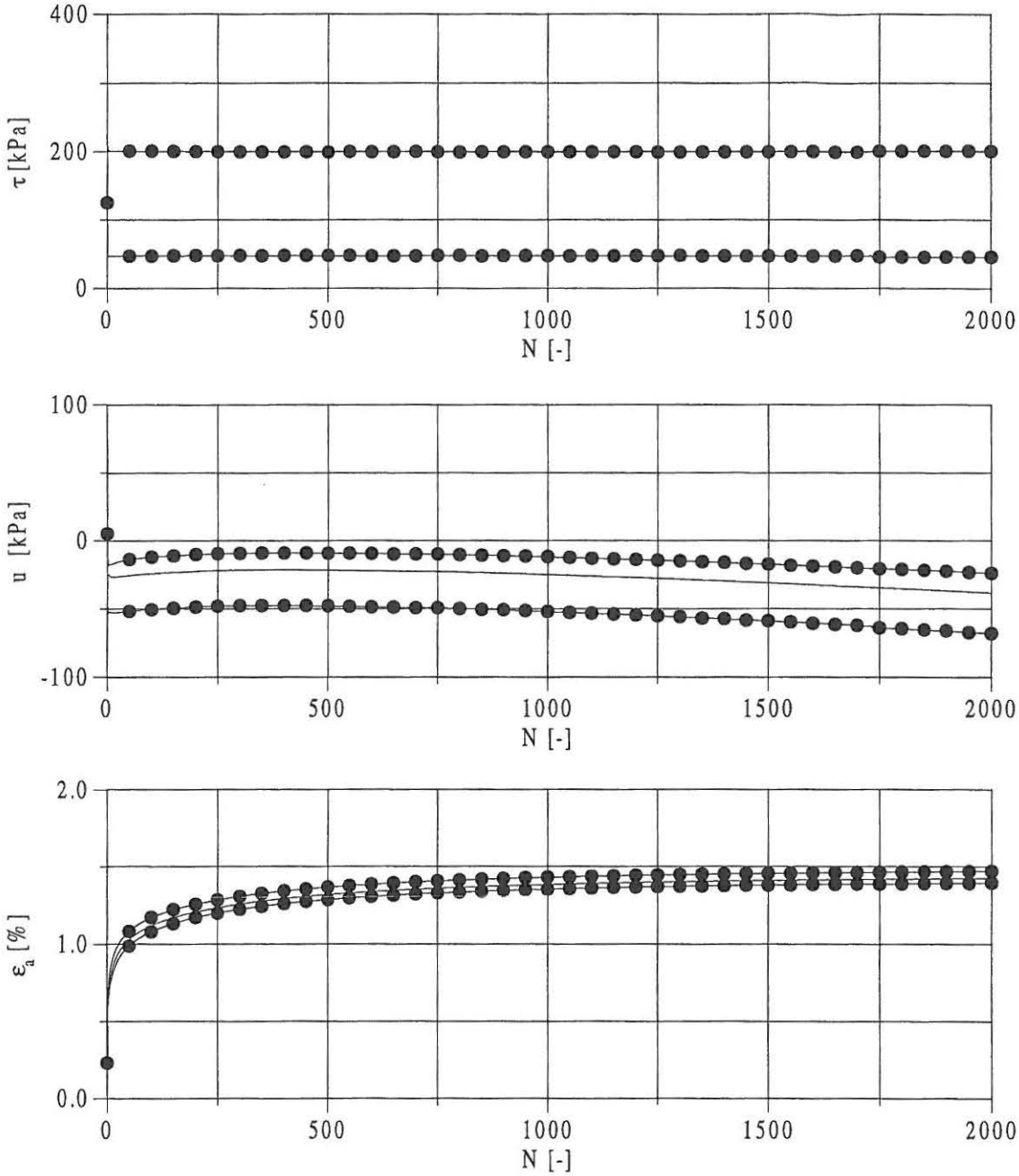
Cyclic Triaxial Test No. 9701.66



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 35
Evaluated: KPJ	Checked: KPJ

Legend

- Isotropic compression
- Anisotropic compression
- Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 35 Checked: KPJ

Cyclic Triaxial Test No. 9701.67

Description of soil Oosterschelde Sand		Dimension	Before test	Start test	After test
Cyclic Triaxial Apparatus		Height [mm]	71.50	71.50	68.48
		Diameter [mm]	69.70	69.70	71.03
Calibration file Cal.dat	Date 1998-01-19	Void ratio	0.619	0.619	0.610
		B-value		1.000	

Test program			
	Isotropic consolidation, σ_r' :	125.0	kPa
	Loading rate:	5.0	kPa/min
	Anisotropic consolidation, τ_o :	62.5	kPa
	Loading rate:	5.0	kPa/min
	Cyclic loading, $\Delta\tau_{cyc}^{pre}$:	25.0	kPa
	Period:	10.0	s
	Anisotropic consolidation, τ_a :	162.5	kPa
	Loading rate:	5.0	kPa/min
	☒ Applied drained		
	☐ Applied undrained		
	Cyclic loading, $\Delta\tau_{cyc}$:	121.9	kPa
	Period:	10.0	s

Isotropic compression		
Confining pressure (σ_r)	325.6	kPa
Pore pressure (u)	200.6	kPa
Axial strain (ε_a)	0.10	%
Volumetric strain (ε_v)	0.42	%

Anisotropic compression		
Shear stress (τ_o)	62.9	kPa
Confining pressure (σ_r)	325.6	kPa
Pore pressure (u)	200.6	kPa
Axial strain (ε_a)	0.37	%
Volumetric strain (ε_v)	0.57	%

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 36
Evaluated: KPJ	Checked: KPJ

Cyclic loading (drained precycling)		
Number of cycles applied (N)	400	
Axial strain (ε_a)	0.60	%
Volumetric strain (ε_v)	0.66	%

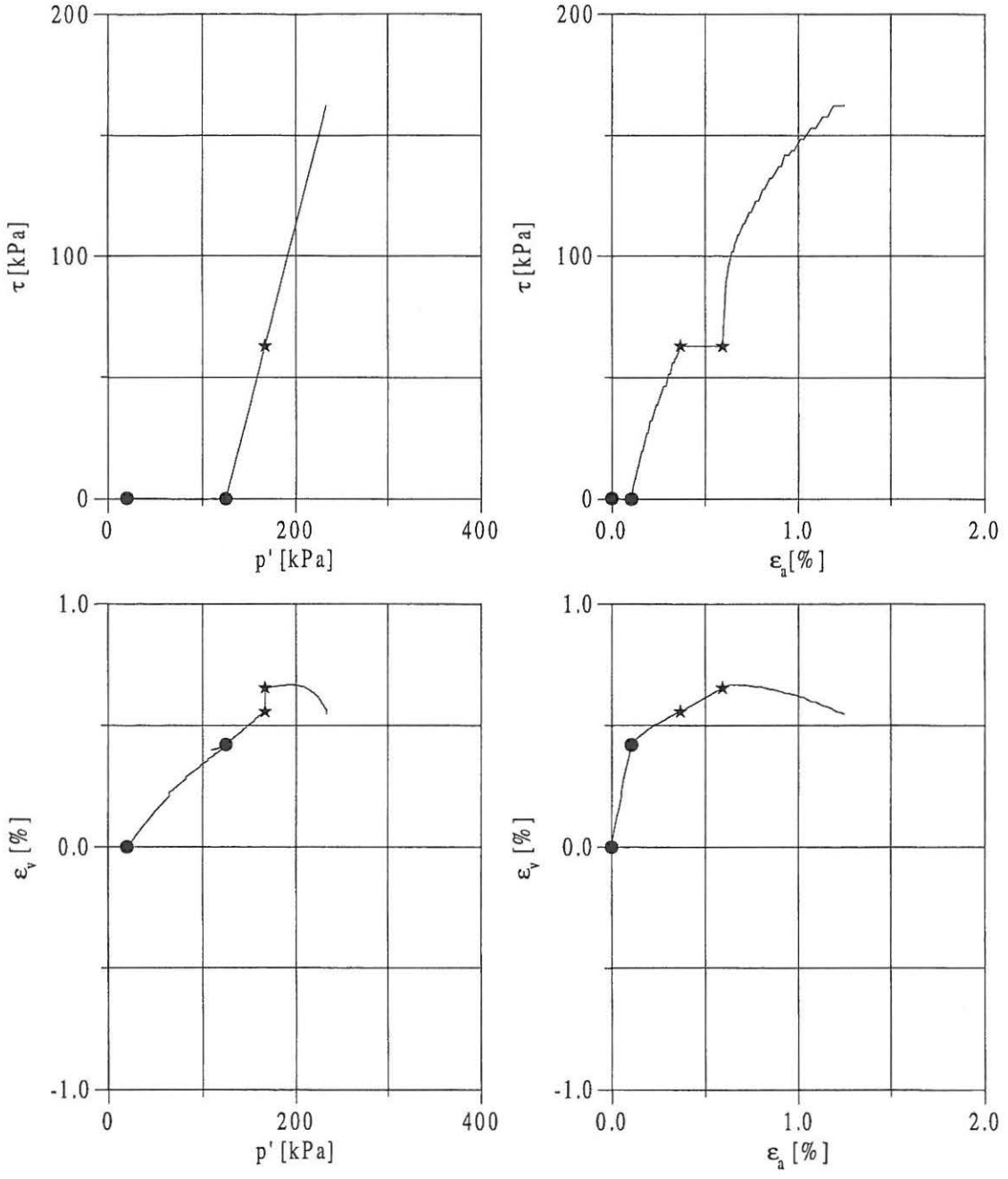
Anisotropic compression	Local	Global	
Shear stress (τ_a)		162.4	kPa
Confining pressure (σ_r)		325.7	kPa
Pore pressure (u)		200.6	kPa
Axial strain (ε_a)	0.65	1.25	%
Volumetric strain (ε_v)	-0.11	0.55	%

Cyclic loading	N=1	N=5	N=10	N=25	N=50	
Permanent pore pressure (u^p)	-38.1	-55.5	-61.4	-66.4	-68.0	kPa
Cyclic pore pressure (u^{cyc})	52.6	24.7	23.3	23.8	24.7	kPa
Permanent axial strain (ε_a^p)	1.10	1.42	1.60	1.84	2.03	%
Cyclic axial strain (ε_a^{cyc})	0.27	0.08	0.08	0.07	0.07	%
	N=100	N=250	N=500	N=750	N=1000	
Permanent pore pressure (u^p)	-67.6	-63.1	-55.0	-45.7	-37.7	kPa
Cyclic pore pressure (u^{cyc})	24.9	23.6	20.4	17.5	15.3	kPa
Permanent axial strain (ε_a^p)	2.23	2.52	2.83	3.08	3.29	%
Cyclic axial strain (ε_a^{cyc})	0.07	0.06	0.06	0.06	0.06	%
	N=1250	N=1500	N=1750	N=2000		
Permanent pore pressure (u^p)	-33.1	-29.9	-27.4	-25.2		kPa
Cyclic pore pressure (u^{cyc})	13.6	12.1	11.0	10.0		kPa
Permanent axial strain (ε_a^p)	3.50	3.74	3.98	4.23		%
Cyclic axial strain (ε_a^{cyc})	0.06	0.06	0.06	0.06		%

Remarks:

Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 36
Evaluated: KPJ	Checked: KPJ

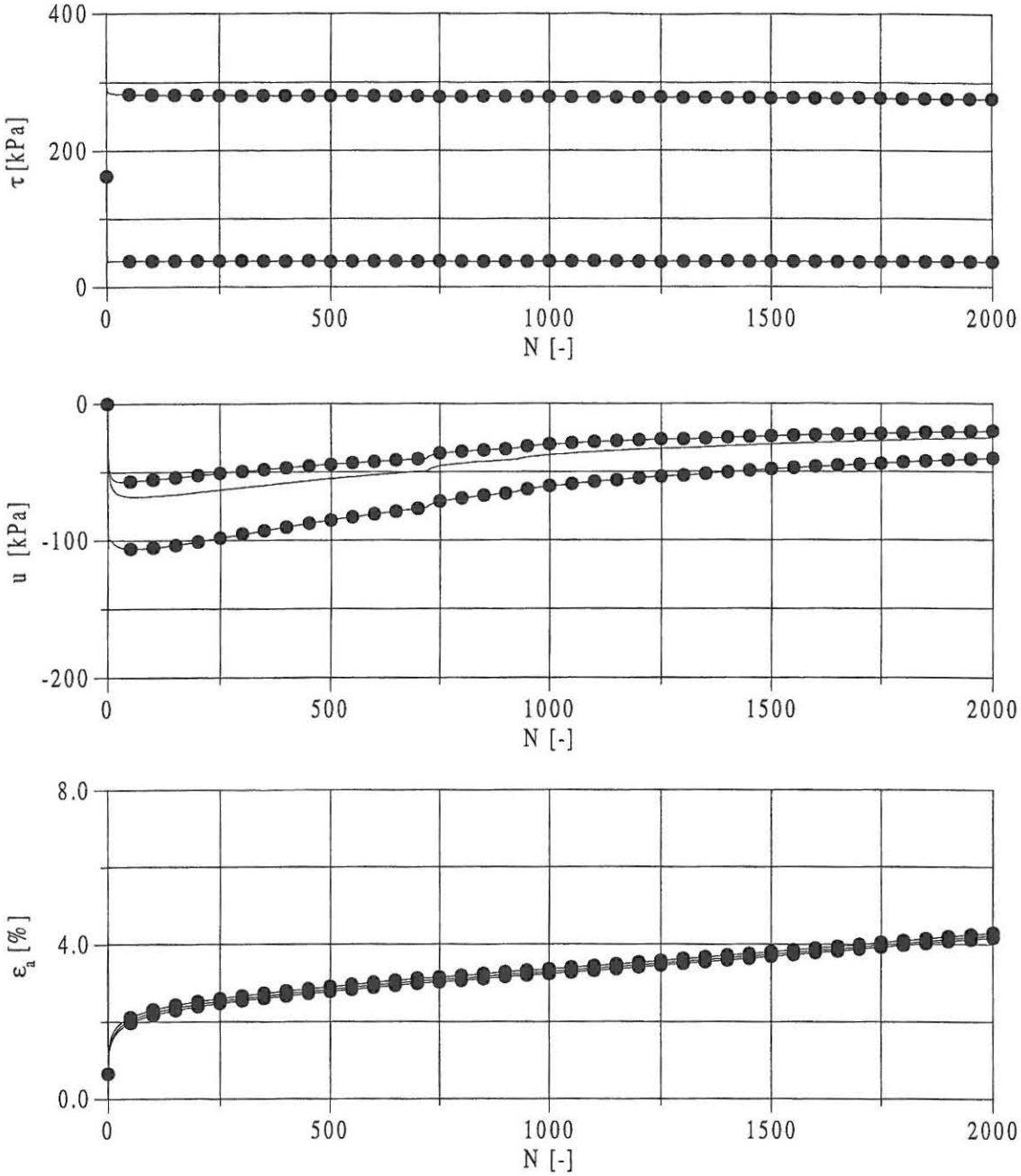
Cyclic Triaxial Test No. 9701.67



Job: MAST III	Aalborg University
Executed: KPJ	Enclosure No. 36
Evaluated: KPJ	Checked: KPJ

Legend

- ● Isotropic compression
- ——— Anisotropic compression
- ★ Precycling



Remarks

Job: MAST III	Aalborg University
Executed: KPJ Evaluated: KPJ	Enclosure No. 36 Checked: KPJ